

Proceedings for the European Conference on Reflective Practice-based Learning 2025

Aalborg, November 17th-19th 2025



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Proceedings for the European Conference on Reflective Practice-based Learning
2025

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This is the third publication in the series: Proceedings for the European Conference on Reflective Practice-based Learning (ECRPL)

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Table of contents

ECRPL 2025 proceedings: Editorial	7
Becoming Caring Professionals in Daycare Practice	15
Reflective Practice-Based Learning: How Do We Understand “Practice”? 17	
Integrating Reflective Practice-Based E-Learning for Person-Centred Nursing	19
AI Literacy and Reflective Practice: Nursing Educators’ Prompt-Based Cases	21
Exploring Teachers’ Professional Growth Through Reflective Practice in School Settings	27
Fundamentals of Systematic Reflection in Practice: How Reflective Practice Effect Professional Identity Formation and Lifelong Learning	47
Returning from Practice to Theory to Practice too	65
Bridging Learning and Practice: Exploring Transfer and Learning in Finance Internships	81
Work-integrated Reflective Learning and Business Outcomes Among College Graduates	103
Peer Feedback as a Future Competence – Improving Reflective Practice-Based Learning	127
Reflecting for Change: How Pedagogical Diploma Assignments Become Reflective Boundary Objects for Change of Practice	147
Simulation-based e-communication as a Reflective Learning Tool for Nursing Students	183

An Action-oriented Understanding of Reflection	205
RPL in Teacher Education: A Science Teacher Education Example from the USA	227
Exploring Reflective Practice-Based Learning Through Game-Based Design	241
The Role of Disruptive Technologies in Shaping Reflective Practice-Based Learning: Insights from AI and Ethical Considerations	261
Triggering Reflection Through Ecotones: The Role of GenAI Vignettes	281
Disruptive Technologies and Peer-learning for Dialogue and Reflection	301
Integrating Virtual Reality in Occupational Therapy Education	323
Generative AI in Reflective Learning: Bridging Literacy Gaps	343
Applying Reflective Practice-Based Learning (RPL) Principles in Clinical Education	367
Navigating the Double-Edged Sword of AI Integration in Higher Education: Student Perspective	377
Effectiveness of Immersive VR for Reflective Learning in Architectural Technology and Construction Management Education	389
Experimental AI Lab in Journalism and Communication	401

ECRPL 2025 proceedings: Editorial

Susanne Dau & Thomas Kjærgaard

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In this volume, we present the contributions accepted for the Third European Conference on Reflective Practice-based Learning (ECRPL25), November 2025.

This edition of the proceedings for ECRPL contains a collection of contributions to the third European Conference on Reflective Practice-based Learning (ECRPL) 2025 hosted by University College of Northern Denmark (UCN) in Aalborg. For ECRPL 2025, the theme is “Reflective Practice-based Learning (RPL) and the Future of Practice-oriented Education”. The proceedings present the peer-reviewed contributions from educators, researchers, and practitioners. The contributions delve into the evolving landscape of reflective practice in higher education and professional settings.

Reflective Practice-based Learning (RPL) emphasizes the integration of experience, thinking, and action as foundational elements of the learning process. This approach is particularly relevant in bridging gaps between theory and practice and gaps between education and professions and businesses. The RPL framework should create good conditions for fostering a deeper theoretical understanding and better competencies for applying theoretical knowledge in real-world contexts. As we navigate the complexities of modern education, RPL offers a robust framework for developing critical thinking, adaptability, and lifelong learning skills.

The contemporary landscape of RPL and the future of practice-oriented education

ECRPL targets the exploration of current research practices of RPL in higher education and professional practices. The educational landscape of higher education is continuously challenged. Innovative technologies, especially artificial intelligence, and large language models (LLM, Chatbots) are challenging education, learning, exam, and assessment

procedures. The affordances and possibilities nested in new and emerging technologies are challenging and changing the need for skills and competencies at the workplace and in our private lives. Thus, our pedagogical approach to teaching, the programmes and the curricula are up for debate, adjustment, and maybe even a dramatic revamping in some instances.

Moreover, the RPL research addresses problems of recruitment and retention of students in education. Contrary to societal challenges and a decline in youth population numbers, the labour market, increasingly, needs highly qualified professionals. So, fewer students in relation to a higher demand for professionals call for a focus on retention and student support. More than ever, these challenges call for contemporary research studies addressing the role of reflective practice, collaborative teaching and learning activities, and scaffolding of students' learning pathways in and across theory and practice.

These tendencies call for developing more reflective and resilient professionals with agency, who can make *in situ* professional judgements and take educated actions.

Reflective practice-based learning is a recent contribution to the educational field, drawing on the theoretical legacy of (among others) Dewey, Kolb and Schön, thus emphasising experience, thinking and action as key concepts underpinning reflective practice-based learning. RPL presents itself as an approach to teaching and learning that promotes a strong, omniscient, and immanent focus on promoting reflection as part of the learning experience.

The themes at ECRPL 2025

RPL is particularly suited for professional practice and education, thus suggesting an approach to the ever-relevant relationship between theory and practice. ECRPL 2025 hope to facilitate the sharing of ideas, research results and experiences with similar initiatives at other institutions, as well as theory, practice, development of and designs for reflective-based teaching and learning in higher education.

This conference proceeding consists of research contributions to ECRPL 2025 within the overall themes of:

- 1. Research on Organisational Perspectives on RPL and Lifelong Learning:** In line with lifelong learning and the demand of continuous learning and competence development among professionals, it becomes relevant to investigate the role of RPL in organisations, how, what and why RPL affect organisational learning cultures or explore the relation between RPL and lifelong learning in organisational learning cultures.
- 2. Placement and/or Practice-Oriented RPL:** Research that examines the role of placements and/or practice-oriented learning in RPL and discussions on how placements facilitate RPL seems to be limited. There is a need for research addressing the benefits and challenges of practice-oriented RPL, as practice-oriented learning is highlighted in several policy documents, including the need for innovative approaches to scaffold practice-oriented educational practices.
- 3. Disruptive Technologies, Technological Literacy, and RPL:** In this rapidly evolving digital age, we are keen to understand how disruptive technologies like VR and AI are influencing RPL and how technological literacy plays a role in this context. Research seems to be limited in relation to the potential of AI in enhancing RPL, the role of technological literacy in navigating and leveraging these technologies, the ethical considerations, and the future of RPL in the context of AI and other disruptive technologies.

The proceedings include research, which addresses aspects such as collaborative learning, lifelong learning, professional judgement, and pedagogy, including cases and examples highlighting, e.g., digital technologies, collaboration, design patterns and signature pedagogy. The pedagogical aspects of reflective practice-based teaching and learning, such as feedback, collaboration, project- and casework, have also been included in the programme.

ECRPL2025

The response to this year's call for contributions has confirmed that there is a growing interest in the topic of reflective-based teaching and learning in higher education.

ECRPL 2025 presents two keynote speakers, a panel discussion and a series of parallel paper and poster sessions.

The first keynote presenter at ECRPL 2025 is Etienne Wenger-Trayner.

Etienne Wenger-Trayner is a globally recognized thought leader in the field of social learning. His early books include the seminal work “Situated Learning,” where the term “community of practice” was coined. Etienne is a sought-after consultant and one of the most cited authors in the social sciences. His more recent books, coauthored with Beverly Wenger-Trayner, further the theory and practice of social learning: “Learning in Landscapes of Practice,” “Learning to make a difference, Systems Convening, and the Communities of Practice guidebook.

The theme of the keynote is ‘A social learning perspective on reflective practice-based learning’.

The notion of reflective practice was introduced by Schon as a conversation with the situation. While we subscribe to his view, we believe that it needs to be expanded to include the social dimension of learning. For this, we propose the notion of a social learning space, with its three dimensions of caring to make a difference, engaging uncertainty, and paying attention. What does reflective practice-based learning look like in a social learning space? We introduce the concept of learning flows and loops by which social learning and practice are closely linked. Our framework can be used both to foster the social dimension of reflective practice-based learning and to assess the value it creates.

The second keynote presenter at ECRPL2025 is Anders Buch

Anders Buch is a Senior Associate Professor, PhD. Head of Research Programme at the Research Centre for the Study of Professions, at VIA

University College; furthermore, Anders is affiliated with Jönköping University. His research centres on professions, professionalism, and technological expert cultures, with a theoretical approach grounded in Science & Technology Studies, Practice Theory, and classical American Pragmatism. Anders has published extensively on topics including knowledge, learning, education, professionalism, and the professional development of engineers.

The theme of Anders' keynote is 'Placement and the Politics of the 'Practical' in Education. The critical dimension of RPL'

Traditionally, schools have been viewed as the primary setting for learning, while workplaces have been designated as spaces for applying acquired knowledge and skills. Recently, however, this model has come into question, with educational placements now being recognized as valuable sites for fostering meaningful learning experiences. Placement is increasingly seen not only as a bridge between education and employment but also as a powerful catalyst for developing critical skills and insights.

While this shift challenges the traditional division of authority between school-based and work-based learning, it often tends to reproduce the longstanding theory-practice dichotomy in education. In this keynote, I will examine key trends in educational policy and discuss how a reflective, problem-based approach to placement can help reimagine the relationship between school and workplace learning, offering a fresh perspective on facilitating problem-based learning and bridging the theory-practice gap.

Shared, collaborative discussion panel.

At ECRPL 2025, we are proud to present a collaborative panel discussion. A discussion based on the delegates' and research experts' questions and comments, compiled during the conference. The panel will be discussing the themes of educating for practice, the theme of reflecting to connect education and professions/businesses, and the theme of educating for a targeted purpose while maintaining a deeper, theoretical reflection.

The panel discussion is an expert discussion between Lecturer & PhD Roland Hachmann from UCSYD, Lecturer & PhD Camilla Gyldendahl

Jensen from UCN, Lecturer & PhD Stine Bylin Bundgaard from UCN and Senior Research Associate & PhD Susanne Dau from UCN. Lecturer and PhD Thomas Kjærgaard will facilitate the panel discussion. The discussion will be based on questions raised by the delegates addressing the themes of the conference and on the dialogues that emerge in the sessions and in the hallways when the delegates share ideas while enjoying a cup of coffee.

This year, the academic committee has accepted many highly relevant contributions. We are delighted to present a programme with papers and posters from researchers from around the world, with a majority of contributions from Denmark. Several authors are revisiting delegates, who have contributed to the conference more than once, for which we are grateful, and we are happy to acknowledge the contributing authors, both new and familiar.

Furthermore, we would like to thank the many dedicated reviewers who have helped secure the high quality of the papers and posters in the conference programme. Your contribution to this growing research community is much appreciated.

For readers, we hope you will enjoy the contributions published in the proceedings and contribute to the next edition in 2027.

POSTERS

Becoming Caring Professionals in Daycare Practice

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University College of Northern Denmark

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Poster presentation

Contemporary research on care in pedagogical practice has primarily focused on how care professionals and students conceptualize the notion of professional care. However, little is known about how students in the Danish bachelor's programme in social education perceive and enact care within daycare settings. Moreover, Reflective Practice-based Learning (RPL) emphasizes that "understanding" alone is insufficient, as knowledge development necessarily involves experience, reflection, and action (Horn et al., 2020). Accordingly, this study asks: How do social education students conceptualize and enact care in daycare practice, and how are their perspectives shaped by experiential learning and educational policy?

Using discourse analysis, the study frames care as a professional practice-in-the-making, highlighting how aspiring pedagogues engage with care through experience, reflection, and action in everyday daycare settings.

The project draws on Wahlgren et al.'s (2002) conceptualization of experience as a dimension of meaning in the learning process, while situating the individual within a broader social and institutional context. Methodologically, the study applies a qualitative design that combines experiential learning theory with discursive policy analysis. In particular, Bacchi's (2009) What's the Problem Represented to Be? (WPR) approach is employed to analyse how policies represent and regulate professional care, thereby shaping pedagogical practice and the educational framework.

The empirical material consists of narratives generated from eight bachelor's students in social education. All participants were selected

based on their practical experience, having completed two six-month daycare placements, and are due to graduate within five months. Informed consent was obtained from all participants. The analysis draws on the WPR approach in combination with Højgaard & Søndergaard's (2015) concept of subjectivation. From the narratives, three central themes were identified: the good professional pedagogue, care as implicit, and the valued/appreciated pedagogue.

Preliminary findings suggest that discursive constructions and subjectification processes shape how students perceive and perform care in daycare practice. These findings are discussed in relation to RPL, emphasizing the role of policy in guiding students' actions and learning processes. Furthermore, the students' narratives provide a concrete written framework for connecting experience, reflection, and action. Finally, the cases illustrate how appropriate disruptions may serve as a foundation for further exploration in future educational contexts.

Keywords

Care, education, policy, WPR approach, daycare students' perspective, RPL

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Reflective Practice-Based Learning: How Do We Understand “Practice”?

Louise Kragh Ottesen, Lise Bach-Sørensen & Trine Fritzner Jensen

University College of Northern Denmark

DOI: <https://doi.org/10.54337/ecrpl25-10912>

Poster presentation

Characteristic of Academy Profession programmes is their strong connection to practice and the labour market. These programmes aim to educate graduates who can act professionally in a work-related context.

At UCN, Reflective Practice-Based Learning (RPL) constitutes a shared pedagogical foundation, from which individual programmes expand with relevant teaching methods and techniques. RPL has been developed within a professional pedagogical context, where the relationship to practice is different and where programmes alternate more frequently between theory and practice than what is typical for Academy Profession programmes. This is further complicated by the fact that several of the Academy Profession programmes are polyvalent, meaning they educate for a broader range of professional practices. The aim of this project is therefore to explore how the concept of *practice* is understood within the context of Academy Profession education, in order to further qualify the application of RPL at this educational level.

In the first phase of the project, a systematic literature review was conducted, based on articles from Denmark, Norway, and Sweden, published between 2017 and 2023. Search terms for the review included *reflection*, *practice*, and *Academy Profession*, in various inflections and combinations. The terms were translated into English, Swedish, Norwegian, and Nynorsk. The focus on Scandinavian countries was due to their structural similarity to the Danish Academy Profession programmes in terms of pedagogical and educational level.

The literature review resulted in five core articles, each contributing to a deeper understanding of the concept of *practice* in both vocational and Academy Profession contexts.

Following analysis of the articles, three concepts emerged as central to understanding practice as a pedagogical concept in relation to teaching: *authenticity*, *communities of practice*, and *identity formation*. Common to these concepts is that they do not directly define what *practice* is, but rather illustrate how teaching can become more practice-oriented, practice-relevant, and practice-based.

To qualify and test these concepts in an RPL context, the second phase of the project involved engaging lecturers through a series of workshops. The aim was to unpack and contextualize the concepts in order to establish a foundation for developing RPL methods and techniques tailored to each individual programmes.

Keywords

Reflective practice-based learning, academy profession programme, practice, autenticity, communities of practies, identity formation

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Integrating Reflective Practice-Based E-Learning for Person-Centred Nursing

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DOI: <https://doi.org/10.54337/ecrpl25-10913>

Poster Presentation

Practice-Oriented Reflective Practice-based learning (RPL) supports students in developing their ability to reflect on their practice, accommodating various learning styles and preferences through diverse activities (Horn et al., 2020). E-learning courses support students in developing reflection and critical thinking skills by giving them more time to pause and contemplate—something that's often limited in traditional classroom settings (Khan & Setiawan, 2019; Geisnæs & Olesen, 2021). At University College of Northern Denmark, a person-centred nursing e-learning course was designed and implemented as part of the Bachelor of nursing program. However, the evaluation showed that many students were unfamiliar with the course. E-learning also offers valuable flexibility in terms of time and location, benefiting both students and educators (Danmarks Evalueringsinstitut, 2019). The same needs have been observed in the nursing education program at UCN, leading to the development and implementation of an e-learning course that reflect the fundamental principles of RPL. The project aims to explore how RPL can be used to develop e-learning subject didactics that support students' ability to reflect on person-centred nursing.

An adapted experience-based co-design (EBCD) approach was applied using a student-driven research-based innovation of didactic design. This approach was utilised to gain insight into students' experiences (Pollitt et al., 2023) and to coproduce priority improvements and actions for the E-learning course for person-centered care in nursing education. This adheres to the RPL principle no. 1: Students experiences (Horn et al., 2020). Six first-year and six third-year nursing students

were invited to participate in two workshops to co-design priority improvements and actions for developing e-learning activities.

The findings provided insight into students' perceptions of the e-learning course. The students rated revision of the visual layout a first priority improvement highest. They emphasised the relevance of the content in relation to both theoretical and clinical teaching activities. Furthermore, they found e-learning activities such as quizzes, podcasts and short recordings with students motivating.

This project captured, explored and understood nursing students' experiences and identified improvement priorities for an e-learning course on person-centered nursing. The use of RPL principles and EBCD enabled students to reflect on e-learning subject didactics to learn person-centred care.

Keywords

Student Experience, Reflective Practice-Based Learning, Experience Based Co-design, E-learning

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AI Literacy and Reflective Practice: Nursing Educators' Prompt-Based Cases

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DOI: <https://doi.org/10.54337/ecrpl25-10914>

Poster presentation

The aim of the study is to provide a new perspective on the characteristics of nursing educators' AI literacy through prompt-based case creation. The goal is to contribute new knowledge to understand educators' AI literacy and the connection between theory and practice using Reflective Practice-Based Learning.

Background

AI in nursing practice and science is transforming the development of patient-centred healthcare. However, empirical research on nurse educators' AI literacy in higher education is sparse. Reflective Practice-Based Learning supports the integration of theory and practice, fostering deeper understanding and application of knowledge as part of AI literacy.

Method

The study employs the ELYK participatory design-based method for the design process (Bang & Dalsgaard, 2012). Empirical data consists of 11 educators' individual prompt texts over two months, scaffolded by three prototyping workshops. 11 teachers at the Department of Nursing Education are included in the study. The empirical data consists of a collection of the prompt text generated by the 11 participants and notes from the qualitative observations.

Data Collection

Qualitative observations were recorded during the assessment process. Prompts were analysed through thematic analysis (Clarke & Braun, 2017), revealing themes within reflective practice-based learning, person-centred care, and AI literacy. RPL supports the connection between theoretical knowledge and practical application, enhancing both teaching methods and learning outcomes (Jensen, Georgsen & Dau, 2023).

Results

The findings illustrate how the teachers' prompt history in AI-based cases is characterised by a balance between theory and practice, supporting reflective practice-based learning and partly scaffolding AI literacy. The results indicate varied responses to the prompt-based case creation process:

- Educators' prompt history in AI-based cases balances theory and practice.
- It supports reflective practice-based learning and partially scaffolds AI literacy.
- There is no clear evidence that prompt-based case creation fully supports AI literacy, indicating a need for further research.

Conclusion

While prompt-based case creation shows promise in enhancing teaching methods and integrating AI in educational practice, more research is needed to fully support educators' AI literacy. RPL plays a crucial role in bridging the gap between theory and practice, benefiting both educators and students by fostering a reflective and integrative learning environment. Nevertheless, the study findings indicate that teachers experimenting with prompts during case creation result in more efficient teaching methods and better integration of AI in educational practice for the benefit of future professionals.

Keywords

AI Literacy, Reflective Practice Based Learning, Nursing Education, Prompt, Case Creation

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Full Papers

Exploring Teachers' Professional Growth Through Reflective Practice in School Settings

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DIO: <https://doi.org/10.54337/ecrpl25-10916>

Abstract

Teacher professional growth is a reflective and contextual process shaped by both personal and institutional factors. This study aim investigates how reflective practice within school settings fosters professional development, focusing on teachers' experiences in a Lithuanian general education school implementing a unique personal professional development (PPD) framework. Sixteen teachers participated in semi-structured phenomenographic interviews to explore their reflective experiences. Analysis using phenomenographic methodology revealed three interrelated categories of professional growth: (A) changes driven by individual reflection, (B) collegial collaboration aligning personal and institutional goals, and (C) development enabled by the school's organisational framework. These categories form a recursive structure within the PPD framework, where each one supports and enhances the others. This study emphasises Category A – reflection-driven growth – as a foundational method for learning from one's own and others' experiences. Teachers who engaged in continuous, systematic reflection – linking theory and practice – demonstrated improved self-awareness, enhanced pedagogical practice, and a stronger professional identity. Key elements contributing to growth include personal attitudes, student-focused teaching, and emotional engagement in teacher-student interactions. The findings highlight the significance of structured reflective practice as a catalyst for sustained teacher development in school contexts.

Keywords

Teacher, Professional Growth, Reflective Practice, School Settings

Introduction

The modern world is marked by rapid changes and uncertainty. This demands continuous learning and adaptability. In this context, teachers play a key role – not only as knowledge providers but as reflective learners who grow professionally (Illeris, 2004; Korthagen, 2014, 2016; Korthagen & Nuijten, 2022). As a result, growing attention is given to teachers' deeper professional growth, including personal change and identity development (Clarke & Hollingsworth, 2002; Evans, 2014; Taylor, 2020; Mockler, 2024). Traditionally, professional development involved short-term external training – seminars, courses, or lectures – where teachers acted as passive recipients (Guskey, 2000). These rarely brought lasting changes in beliefs or behaviour (Korthagen & Vasalos, 2005). Newer research frames professional development as a continuous and meaningful process – professional growth. It includes knowledge development, self-reflection, and identity strengthening (Rodgers, 2002; Beauchamp & Thomas, 2009; Evans, 2014; Pylväs, Li, & Nokelainen, 2022).

Teachers grow by learning from experience, reflecting on practice, and aligning actions with student needs and personal goals (Clarke & Hollingsworth, 2002; Núñez Pardo & Téllez Téllez, 2015). Reflection plays a central role – it supports analysis, improvement, and value clarification (Korthagen, 2001; Rodgers, 2002). Growth happens through interaction with colleagues, students, and school context (Opfer & Pedder, 2011). Thus, it involves both individual and collective learning, supported by a strong professional culture (Hargreaves & Fullan, 2012; Donohoo et al., 2020). Schools that build reflective cultures create favourable conditions for sustainable teacher development (Vescio et al., 2008; Putnam & Borko, 2000).

Professional growth is often seen as a key outcome of professional development. It includes both external skill acquisition and internal change in thinking, values, and behaviour through reflection (Evans, 2014; Pylväs, Li, & Nokelainen, 2022). It becomes an integrated process where learning and personal transformation reinforce each other. Despite this attention, teachers' lived experiences of growth are still underexplored. Research tends to focus on formal training, neglecting self-reflection as a change driver in real school settings (Opfer & Pedder, 2011; Taylor, 2020). It is therefore important to examine professional growth in con-

texts where teachers reflect, collaborate, and act. Such environments foster genuine professionalism.

This article aims to contribute to the scholarly debate on teachers' professional growth by analysing the importance of reflection as an essential tool for learning from experience. The study is based on the view that professional growth is both a personal and social process taking place in an environment based on the specific context of the school. *The problem research question:* How does reflective practice within school settings promote teachers' professional growth?

The aim of the research is to investigate teachers' professional growth through reflective practice in the school context, analysing the significance of reflection as a key method of learning from one's own and others' experiences.

Theoretical background

Intersection of professional development and professional growth

In the scientific literature, the concepts of professional development and professional growth are often confused or used interchangeably, although their contents differ. Professional development is usually defined as a career-long learning process covering both the development of knowledge and skills and the formation of value attitudes related to professional and personal abilities (Illeris, 2003). Many studies link professional development to teachers' learning in practice to achieve better student outcomes (Avalos, 2011; Postholm, 2012).

Professional growth, in contrast, implies a deeper identity change based on reflection and context. It is both an outcome and a goal of development (Pylväs, Li, & Nokelainen, 2022). Growth is shaped by subjective experience and supported by school culture—values, structures, and collaboration (Hargreaves & Fullan, 2012). Teachers grow through experimentation, reflection, and shared practice (Min et al., 2020).

Clarke and Peter (1993, p. 167) used the term 'professional growth' to emphasise that the teacher's changes are the result of continuous professional learning. Clarke and Hollingsworth (2002), referring to Guskey (1986), developed an integrated model of professional growth that allows interpreting the teacher's growth process as a dynamic interaction between personal practice, external factors, and reflection. This interac-

tion operates through the teacher's experience, and professional growth is not only related to learning, but also to personal and collective meaning-making practices. Finally, professional growth takes place in the social and material work environment, where the teacher's individual experiences and perceptions of the environment determine the direction of his/her learning and growth (Pylväs, Li, & Nokelainen, 2022). The transition to a culture of continuous professional growth is a prerequisite for achieving long-term improvement of teachers and the entire education system.

Professional growth through reflective practice

Professional growth involves intentional change in thinking, behaviour, and values. It reflects both skill development and personal transformation, where reflection plays a central role (Clarke & Hollingsworth, 2002; Evans, 2014). Teachers grow by analysing their actions, integrating theory with practice, and learning from experience. In the late 20th century, teachers began to be seen as reflective practitioners. Reflection enables them to understand their work and improve it deliberately (Korthagen, 2001). It helps explain decisions, adjust actions, and increase professional satisfaction (Villegas-Reimers, 2003).

The teacher's activity is inherently complex and multifaceted, therefore, reflection becomes an essential condition for the ability of teachers to solve professional problems and adapt to constantly changing educational conditions (Korthagen, 2001). Teachers' reflection is necessary because of the constant encounter with situations of professional uncertainty, when they have to act on the basis of hypothetical knowledge, intuition, and practical insights (Ferraro, 2000; Tarrant, 2013). In these conditions, reflective thinking allows teachers to make more appropriate decisions, clearly understanding their consequences and applying the necessary changes. Reflection is often associated with critical thinking, which is significant in evaluating the teacher's practice in various aspects, allowing for the identification of strengths and areas for improvement (Larrivee, 2008; Riveros et al., 2012). Liu (2015) emphasises that a reflective teacher must critically evaluate not only his/her own actions, but also their reasons, goals, and expected changes, thus better understanding and managing his/her professional practice and improving his/her professional identity.

The importance of reflection increases even more in the context of a learning organisation. Collective reflection allows teachers to share experiences and together solve problems arising in the educational process, thus strengthening community learning and cooperation (Segal, 2023). Team reflection allows one to avoid isolated learning, encourages the sharing of ideas, advice, and practices, and therefore helps teachers not only better understand their work, but also improve it more effectively (Ohlsson, 2013; Min et al., 2020). The importance of critical thinking in reflective practice is also emphasised by Liu (2015), who states that reflection allows teachers to rethink and reorganise their existing attitudes and professional knowledge. Teachers are given the opportunity to move from automated acting to a conscious, deliberate, and purposeful teaching/learning process, which better meets the dynamic educational environment and the constantly changing needs of students.

Research methodology

Research context

This analytical process was strongly informed by the theoretical underpinnings of teacher professional growth as a reflective, identity-shaping process (Clarke & Hollingsworth, 2002; Korthagen, 2001). The chosen phenomenographic methodology aligned with this conceptualization, allowing us to explore variations in reflective experiences as both individually and socially constructed. The iterative comparison between empirical categories and theoretical constructs ensured that analysis was not only data-driven, but also theory-informed, thereby reinforcing the conceptual robustness of the findings.

The presented research was conducted in one Lithuanian general education school, where the Personal Professional Development (PPD) framework is consistently being developed. Its implementation was driven by both internal needs, i.e., the desire to improve educational practices referring to the analysis of student achievements, and external impulses, i.e., nationally formed priorities for improving teacher qualifications. The school community, having assessed the impact of the CPI (Child's Individual Progress) framework on student achievements, initiated a targeted systematisation of teachers' professional growth, in which the responsibility for improvement was transferred to the teacher himself/herself, while maintaining organisational support.

The school's PPD model differs from typical PD approaches in that it integrates reflection into daily practice at multiple levels—individual, group, and institutional—rather than relying on external training. This internal, recursive system positions teachers not as recipients of change but as active agents of their professional transformation, which is still rarely seen in national or international PD practices. The PPD model at the school was developed as a framework for reflective workplace learning based on collegial cooperation, continuous self-assessment, and practice improvement. The framework is organised at three levels: individual (setting personal development goals, reflections, consultations with the curator), group (thematic exchange of experience, integrated activities with colleagues), and institutional (internal and external training, cooperation with other educational institutions). Professional development is understood as inseparable from everyday activities and taking place cyclically: planning – activity – reflection – corrections – activity.

The school consciously created a culture of support and trust that encouraged teachers to actively engage in learning processes, share good practices, initiate change, and experiment with educational practices. In this way, the PPD framework has become the axis of organisational culture, the main goal of which is to ensure both individual and collective professional growth. Based on this practice, the study aimed to reveal how teachers experience professional growth while participating in the PPD framework, how reflective practice activities are carried out that encourage them to analyse their experiences and learn from each other, and promote their personal and professional growth, and what ways of perceiving the phenomenon emerge when analysing these experiences.

Research participants

The study involved 16 teachers working at the same school. The participants were selected according to the following criteria: pedagogical nature of work, qualification category, pedagogical experience (at least 1 year), and stability of the workplace. The experience of the selected participants was diverse: their pedagogical experience ranged from 1.5 to 25.5 years, and the qualification categories included teacher, senior teacher, and methodologist levels. Such selection ensured a diversity of research experiences and a conceptual analysis of the phenomenon.

Data collection and analysis methods

The research is based on the phenomenographic methodology of qualitative research, the main goal of which is to reveal different ways of experiencing and understanding the phenomenon under study (Marton, 1986; Bowden, 2000). In this case, the professional growth of teachers, arising from personal experiences of participating in the PPD framework, was examined. Phenomenography was chosen to not only describe the experiences of teachers, but also to conceptualise different notions of development in the learning workplace.

Data were collected using semi-structured interviews, which are considered the main phenomenographic data collection method. The interviews took place in a school environment chosen by the participants themselves, i.e., in an outdoor classroom, in the school garden, or inside the building. The teachers were asked what professional growth in school means to them and how they understand and interpret this process. They were also asked to share their professional growth experiences, what feelings and experiences they had during the professional growth process, and what helped them understand that they had 'grown up'. Each interview lasted 42–66 minutes, was recorded and later transcribed. In order to ensure data accuracy, the transcriptions were submitted for review by the participants and anonymised only after their approval. During the interviews, the researchers sought to maintain the structure of the dialogue, and open-ended questions encouraged the participants to reveal their personal relationship with the phenomenon and the nuances of its understanding.

Data analysis was conducted following the steps of phenomenographic data analysis described by Åkerlind (2005). In the first phase, all the transcriptions were read several times, and primary themes reflecting the participants' experiences were identified. The selected quotes were then grouped into a preliminary pool of meaning, interpreted both in relation to the individual transcript and in the context of the collective dataset. Following this, transcripts were compared side-by-side to identify similarities and differences in the participants' experiences, ensuring that emergent categories were grounded in collective rather than individual meaning, as recommended by Åkerlind (2005).

In the second phase, the thematic similarities and differences between different statements were searched for, primary categories were formed. These categories were subsequently revised to assess their internal con-

sistency, and in the fourth phase, the space of the results was constructed: the interrelationships between the categories, their hierarchical structure, and the conceptual nature of the interaction were analysed. During the analysis, attention was maintained to both the referential (what the phenomenon means) and structural (how the phenomenon is understood) aspects of the phenomenon.

Ethical aspects and reliability

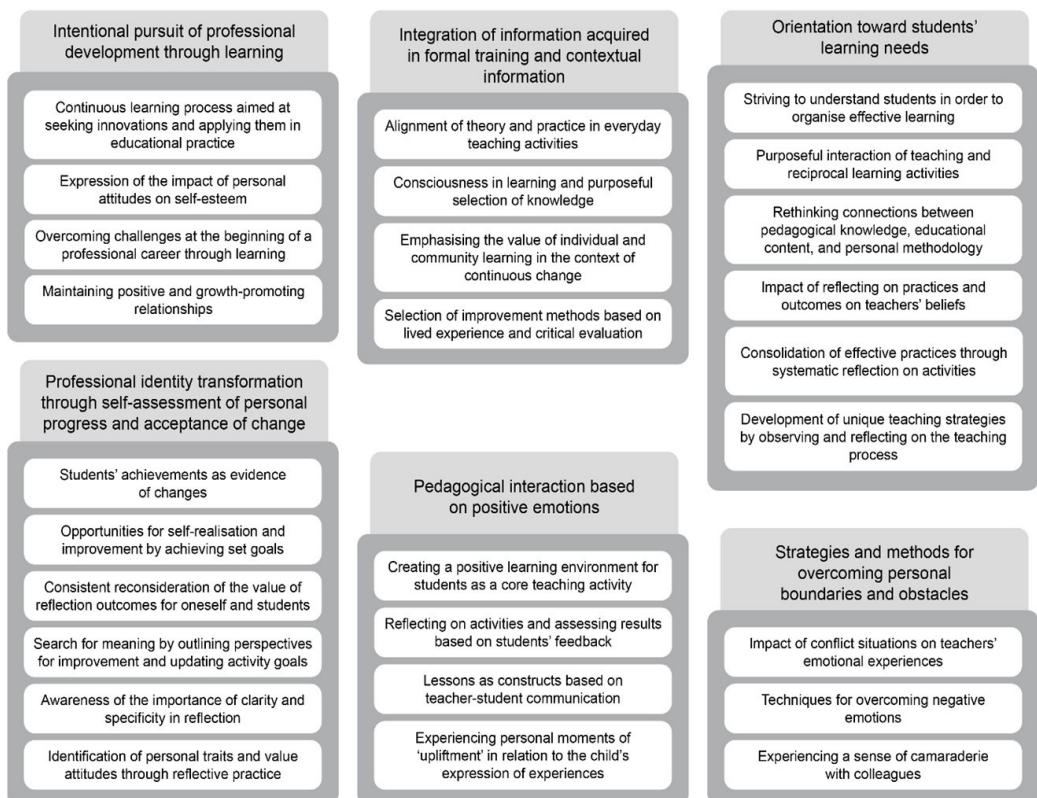
In order to ensure the reliability of the research and the validity of the results, several quality criteria of qualitative research were applied. The reliability of the data is based on a consistent process of analysis, multiple readings of the texts, feedback from the research participants, and constant review of the results by comparing them with the original data. The validity of the results was ensured by contextual interpretation: each category was formed considering its relationship to the whole and justified by quotes from the participants.

The research was conducted in compliance with all ethical principles of social science research. All the study participants were informed about the aim, form, duration of the study and the voluntary nature of participation. Each participant signed an informed consent for participation, and anonymity and confidentiality were ensured: personal data were encrypted and identifying information was removed. Participants were given the right to withdraw from the study at any time, and the study material is used only for scientific purposes. In this way, the study aimed to ensure communicative validity, validity of data interpretation, and transparency of the study, and the phenomenographic analysis made it possible to reveal different ways of experiencing teachers' professional growth in the context of the PPD framework. To increase transparency, coding was conducted by two researchers independently in the initial phase. They used inductive coding to identify descriptive expressions and then collaboratively developed the categories of description. Discrepancies were discussed and resolved through dialogue to ensure intersubjective agreement. Coding decisions were documented in an audit trail, allowing for procedural traceability and confirmability.

Results

The results of the phenomenographic research revealed that the experiences of the professional growth of teachers through participation in the school's personal professional development (PPD) framework encompass three categories: A – changes determined by the teacher's reflection as an experience of professional growth; B – collegial collaboration while seeking coherence between personal and institutional goals; C – personal professional development enabled by the organisational framework. All categories intertwine, supplement, and develop each other, and they are all connected by the personal professional development framework created and used at the school, which acts as a recursive structure. This article details and analyses Category A in more detail, justifying the significance and importance of reflection as an essential method of learning from one's own and others' experiences in school settings. The six subcategories identified under Category A reflect key theoretical dimensions of reflective practice, such as self-directed learning, emotional self-regulation, and identity reconstruction. These elements resonate with Korthagen's (2001) concept of core reflection and Clarke and Hollingsworth's (2002) model of interconnected domains, providing a theoretical lens through which the qualitative differences in teacher experiences were interpreted (see Figure 1).

Figure 1: Changes determined by the teacher's reflection as an experience of professional growth: subcategories and their content (created by the author)



Each subcategory is based on the authentic insights of the research participants, which reveal how professional reflection affects their identity, educational practice, and relationship with students and colleagues. The subcategories of analysis presented below, illustrated with specific quotes from the research participants, encompass reflection processes on various aspects of professional growth, from the conscious pursuit of learning to the strengthening of emotional resilience:

Intentional pursuit of professional development through learning. The research data showed that teachers perceive professional growth as a continuous and purposeful learning process that arises from internal motivation and the desire to improve. This process is inseparable from the constant search for innovations, their application in practice, and the

promotion of critical thinking. Jorè describes it as ‘*constant moving forward, searching... and accepting innovations in your professional activity*’. Professional development helps teachers adapt to modern educational challenges, strengthens their pedagogical self-concept, and increases job satisfaction. In addition, it allows for a better understanding of students’ needs and the effectiveness of educational methods. According to Emilia, ‘*you are forced to learn throughout your life*’, which shows that professional growth is understood as a continuous path leading to a deeper understanding of the teacher’s identity and vocation. Teachers also emphasise that professional growth provides an opportunity for self-realisation through pedagogical activities, which helps maintain motivation, avoid routine, and contribute to students’ progress.

Integration of information acquired in formal training and contextual information. Teachers emphasise that knowledge acquired in formal training becomes valuable only when it is applied in practice and combined with individual experience. Roma notes that the acquisition of knowledge requires active participation: ‘*you try, you pass it through yourself*’. Teachers apply a critical approach to the information received and select the information that is most relevant and appropriate to their educational context. Giedrè raises the question: ‘*do we learn for certificates, or do we learn for knowledge?*’, thus revealing a conscious approach to learning goals. Most teachers emphasise that the most effective learning situation is one where the content meets their daily educational challenges and is directly applicable. At the same time, the community dimension becomes important: sharing insights with colleagues helps to reflect on newly received information and integrate it more deeply. This strengthens not only professional knowledge, but also mutual cooperation, and learning acquires a collective character, where knowledge becomes a common asset of the school culture.

Orientation toward students’ learning needs. The study revealed that orientation towards students’ learning needs is one of the most important objects of reflection. Teachers are constantly looking for ways to better understand students’ experiences and effectively integrate them into the teaching process. They try to observe students’ reactions, their emotional well-being, and cognitive abilities so that education is individualised and meaningful. Roma notes: ‘*the children themselves say: it’s more difficult for us here, we’re not doing well here, could you help?*’, emphasising the importance of children’s voices in the educational process.

Teachers also admit that positive feedback from students motivates them to become more engaged in education, as Nomeda states, this '*encourages the best possible presentation of the material*'. Such mutual interaction develops responsibility and pedagogical sensitivity and allows to create more effective education that meets the needs of the student. This direction not only strengthens the effectiveness of education, but also the teacher's professional identity, as it helps to experience pedagogical joy and satisfaction arising from students' progress.

Professional identity transformation through self-assessment of personal progress and acceptance of change. Strengthening professional identity is a constantly reflected process related to the ability to self-assess, accept changes, and adapt to changing educational conditions. Teachers often identify the success of their activities through students' independence and progress. Ieva observes: '*if the teacher can 'rest' in the lesson and the children work... then everything is fine*'. This shows that self-confidence stems from real educational outcomes. In addition, professional identity is formed through reflection, which allows one to become aware of the experience, assess the significance of changes, and plan further actions. Nomeda emphasises the importance of structure: '*what I've been doing, what it means to me and the students, what I'm going to do next*'. This consistent model of reflection helps teachers strengthen professional confidence and remain open to educational change. Identity changes with experience, i.e., every new situation, challenge, or success becomes part of the teacher's self-perception. Therefore, the ability to reflect allows not only to adapt to changes, but also to consciously create one's own professional identity, which combines personal goals and the requirements of the educational context.

Pedagogical interaction based on positive emotions. Teachers recognise that a positive emotional atmosphere in the classroom is one of the most important factors that promote learning and motivation. Reflection on the emotional relationship with students helps develop pedagogical sensitivity and create trust-based communication and a safe environment. Giedrė reveals: '*when they have fun, I have fun too*', emphasising the importance of mutual emotional connection. Such an environment not only helps students feel good but also acts as a strong source of professional motivation for the teacher. In addition, reflection on the dynamics of lessons allows the teacher to better assess how emotions affect student engagement and educational effectiveness. Jore's self-analysis: '*I'm recon-*

sidering myself, rethinking: well, how am I doing in classes? testifies that emotional engagement becomes a part of reflective practice and an important condition for professional development. Emotions become not only a result, but also a source of professional growth: their reflection helps to adjust the teacher's behaviour, teaching style, and improves the relationship with students.

Strategies and methods for overcoming personal boundaries and obstacles. Teachers often face professional challenges that cause stress, uncertainty, and emotional discomfort. These experiences become an object of reflection, helping to shape resilience and self-regulation strategies. As Karina says: *'it was scary... but with time, both that interest and that search helped'*. Such experiences become part of professional maturity. Teachers actively look for ways to overcome negative emotions, use the support of colleagues, analyse their own behaviour and feedback. Brígita notes: *'our community helps each other when needed'*. This shows that collective support and reflective practice not only help to address emotional challenges but also strengthen a sense of community and long-term professional motivation. In addition, by reflecting on their own limits, teachers are able to identify their emotional needs, set realistic goals, and seek constructive solutions in stressful situations. Such practice allows maintaining emotional balance and ensures the sustainability of professional activity.

Professional growth in the teacher's activity is a complex and constantly changing process, based on reflection, internal motivation, conscious relationships with students and colleagues, and the ability to adapt to changes. Purposeful reflection allows not only to improve practical skills, but also to strengthen professional identity, create an inclusive, emotionally safe learning environment, and maintain high quality education in the long term.

Discussion

The theoretical framework, particularly the model of professional growth by Clarke and Hollingsworth (2002), played a key role in interpreting the findings. These findings align with previous studies emphasising the role of reflection in teacher learning (e.g., Korthagen, 2001; Rodgers, 2002), but this study extends the literature by focusing on how reflection is systematically embedded within an institutional culture. Unlike many other

studies that examine fragmented or individual PD initiatives, this paper demonstrates how a structured school-wide PPD framework fosters ongoing identity transformation and collaborative growth. Each identified category was cross-validated with this model, revealing how individual reflection, collaboration, and institutional support interact dynamically. This alignment supports the analytical claim that professional growth emerges at the intersection of personal agency and contextual affordances. The results of the study confirm the provisions set out in the theoretical justification that reflective practice is an essential condition for professional growth. In the study, teachers described professional growth as a continuous process based on self-regulation, during which a new professional quality is formed through reflection from experience. This corresponds to the statements of Korthagen (2001) and Rodgers (2002) that reflection allows the teacher not only to understand the meaning of his/her activities, but also to systematically change them in order to achieve better quality of education. The participants' statements, expressing the need for continuous learning, self-assessment, ability to overcome challenges, and self-realisation, correspond to the concept of professional growth as an in-depth phenomenon based on identity changes (Evans, 2014; Pylväs, Li, & Nokelainen, 2022). This means that growth does not take place through formal in-service training courses, but through reflective participation in the educational process. Such reflective activity at school turns into an action that has acquired personal significance, which changes not only the external forms of practice, but also the teacher's attitude, beliefs, and professional identity (Clarke & Hollingsworth, 2002; Taylor, 2020; Korthagen & Nuijten, 2022).

The practice of reflection turned out to be extremely important for the formation of professional identity. The research data show that teachers tend to identify with their pedagogical role when they can reflect on students' achievements as a result of their work. Such identity dynamics are based on the assumption that the perception of oneself as a teacher changes through constant reflection on the relationship with students, colleagues, and content (Beauchamp & Thomas, 2009; Korthagen & Nuijten, 2022). This confirms that reflection is not just a way of analysing information, it is an essential mechanism for identity formation. Also, an important observation is that teachers not only reflect individually, but also use collective reflection, sharing experiences, and looking for

solutions together with colleagues. This aspect is closely related to the importance of the professional community highlighted by Hargreaves and Fullan (2012): a culture of reflective practice in school strengthens cooperation and support and creates conditions for sustainable change. Donohoo et al. (2020) highlight that schools that develop reflective collective competence provide an environment for deep learning, and the results of the study empirically support this principle. Significantly, the teachers who participated in the study identified emotional engagement and positive interactions with students as important sources of growth. Reflecting on the emotional climate of the lessons and the students' response, they experienced professional satisfaction and motivation. The results are consistent with Korthagen and Vasalos' (2005) statements about teachers' core reflection, where emotional experiences act as a basis for changes in values and behaviour. Emotional reflection becomes a bridge between professional and personal growth, which confirms the integrality of reflection in the entire educational process.

Another important outcome is the ability to critically evaluate the information received in formal training courses and apply it in real-world situations. Teachers do not accept new information uncritically but rather transmit it through the prism of their own experience and context, which coincides with Putnam and Borko's (2000) statement that effective professional learning only occurs when knowledge is relevant, applicable, and reflected in real practice.

In conclusion, it can be stated that the study empirically substantiates the model of professional growth as a reflective, contextual, and dynamic process. This supports the model of professional growth proposed by Clarke and Hollingsworth (2002), in which reflection acts as a mediator between personal practice, external influences, and outcomes. The teacher's growth takes place in a constant interaction between inner thinking and outer action, and reflection, both individual and collective, is a necessary condition for this interaction.

Conclusion

The results of the study lead to the conclusion that reflective practice is one of the essential factors of teachers' professional growth. Professional growth is manifested through continuous learning, retrospective reflection, strengthening of professional identity, and the ability to adapt

to the dynamic educational process. The teachers who participated in the study perceive professional growth not only as the improvement of knowledge or skills, but also as a deeper personal change, the basis of which is self-reflection, emotional engagement, and conscious relationships with students and colleagues.

The most important contribution of the study is that the empirical data support the concept of professional growth as a dynamic, multi-layered process related to three interrelated areas: individual reflection, collegial cooperation, and organisational support. These factors work synergistically and create a favourable environment for teachers' professional development.

These results reflect broader educational trends promoting teacher agency, identity-focused development, and school-led innovation in professional learning. The study's insights could inform policy development, especially in systems seeking to decentralise teacher learning and embed reflective practices within school culture as a strategy for sustainable educational improvement. Reflection helps teachers not only solve educational challenges, but also maintain professional motivation, create an emotional connection with students, and maintain professional resilience. A reflective approach to everyday practice becomes an integral condition for high-quality pedagogical work, which paves the way for not only individual but also systemic educational change.

Future research and limitations

Future research could expand this topic in several directions. First of all, it is worth investigating professional growth processes in different school contexts – institutions of different cultures – in order to identify contextual factors that influence the effectiveness of reflective practice. It would also be appropriate to develop long-term (longitudinal) research to reveal the development of professional growth over a longer period of time. It would make sense to analyse the forms of reflection and their impact more broadly, for example, how individual, interpersonal, or collective reflection differ, what their advantages and disadvantages are in various pedagogical situations. It is also possible to explore how reflection affects specific aspects of education, for example, student inclusion, assessment methodologies, use of digital technologies. It is recommended to include mixed research methods (quantitative and qualitative), which

would allow assessing the impact of reflection not only by subjective but also by objective indicators. This would help to substantiate the value of reflective practice not only from the perspective of teachers, but also from the perspective of the quality of education.

Despite the valuable insights, the study has certain limitations. First, the study sample was small (16 teachers), therefore, the results cannot be broadly generalised. The participants are from one educational institution that already had a reflective practice support framework in place, therefore, their experiences may be partly exceptional. Such contextual specificity limits the possibility of directly transferring the obtained findings to other settings. Second, data were collected using only one method, semi-structured interviews. Although this method allows to delve deeper into subjective experiences, additional data triangulation would strengthen the reliability of the study and help to better understand how reflection manifests itself in practical activities. The research conducted is focused on the qualitative aspect, therefore, it lacks quantitative data on the effectiveness, systematicity, or impact of changes on student educational outcomes. The school's already well-established reflective culture may have shaped participants' perceptions and responses, potentially amplifying the effects of the PPD framework. This raises the possibility of context-dependent bias. Future studies should critically examine how less supportive or more hierarchical school cultures influence reflective practices and teacher growth to evaluate the transferability of findings.

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Fundamentals of Systematic Reflection in Practice: How Reflective Practice Effect Professional Identity Formation and Lifelong Learning

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Abstract

In a world characterized by constant change and complexity, the need for a strong professional identity and the ability to act as a reflective practitioner has become more crucial than ever. This article explores how systematic reflection can support lifelong learning and professional identity formation, focusing on a pilot study conducted in the Diploma in Leadership at UCN. The study involved the use of reflection portfolios as both a learning tool and empirical data, with students documenting their learning activities and reflections. Through semi-structured interviews and focused content analysis, the study aimed to develop and qualify a reflection model that highlights the connection between learning, reflection, and professional identity formation.

The reflection model presented includes four levels: learning moments, recognition, transformation, and professional identity. Each level is described in detail, with examples from the pilot study illustrating how students used the reflection levels to become aware of their learning and development. The model aims to scaffold the movement from initial aha moments to more conscious and transformative reflections, contributing to the formation of professional identity.

The findings suggest that systematic reflection can significantly impact students' reflective skills, awareness of their own learning, and professional identity formation. By integrating reflection as a central part of education, students can navigate a complex world with greater confidence, competence, and reflexivity. The article concludes with didactic

reflections on how the model can be used in higher education to support lifelong learning and professional identity formation.

Keywords

Reflective practice-based learning, Lifelong learning, Professional identity, Higher education, Portfolio

Introduction

In a world characterized by constant change and complexity, the need for a strong professional identity and the ability to act as a reflective practitioner has become more crucial than ever, placing significant pedagogical and didactic demands on educational institutions (Johansson & Bundgaard 2023). There is a greater need to develop students' reflexive skills through systematic reflection and awareness of their own learning as part of a lifelong learning process. These didactic approaches can support the handling of the complexity and demands they encounter in practice by allowing them to step back, analyze their actions and decisions, and understand the deeper implications of their thinking (Dewey 1910; Horn et al. 2020; Schön 1984). This is not just a theoretical exercise but a practical necessity to resonate with and navigate effectively in an accelerating society (Rosa 2021).

To gain insight into how educators can work didactically to develop reflective practitioners with a strong professional identity who can translate theory into practice and support lifelong learning, we conducted a pilot study on the Diploma in Leadership, specifically in the module 'Personal Leadership'. The students on this module represents several different professions such as teachers, pedagogues, nurses, social workers etc., which together with their foundational education, have shaped their current professional identity, and played a role when we established a reflective room for the development of a professional leadership identity. This necessitated the establishment of a structured scaffolding that both facilitated individual reflection aimed at cultivating a profession-oriented leadership identity and enabled collective knowledge exchange and critical reflection on the similarities and divergences among these identities.

In this module, students systematically worked with reflection levels through exercises designed based on the reflection model presented later

in the article. To collect the students' reflections as empirical data, we asked them to maintain reflection portfolios over all learning activities, allowing us to follow the model's applicability. Their reflection portfolios served as a transformative tool to document, analyze, and systematically reflect on their personalized learning, exemplarity, employability, enabling them to identify patterns, strengths, and areas for professional development and lifelong learning (Stefani, Mason & Pegler 2007).

The study provides insight into how students' systematic work with reflection portfolios impacts their reflexive skills, awareness of their own learning, and professional identity formation. By engaging in a systematic reflection process, students can develop a deeper understanding of their own values, thinking, beliefs, and actions, contributing to their personal growth and their ability to lead others with authenticity and integrity (Wahlgren et al. 2013). In a time when professionals often face complex challenges and rapid changes, reflection becomes a powerful tool to maintain high professionalism (Horn et al. 2020). It helps students to remain adaptable and resilient while maintaining a strong sense of professional identity and expertise. In our review we didn't find any reflection models that could scaffold and visualize the complex reflection process that can state learning and progression during and after education. Within this context, no existing model was found that could adequately structure and visualize the students' attention on prior experiences, their awareness of their own learning processes, and the qualification of their actions — aspects which, from our analytical perspective, may be understood as indicative of efforts to establish and operationalize reflective competence. Therefore, we developed a model, that could scaffold the students' ability to work systematic with reflections that can qualify and enhance their practice as leaders. The model is based on experience from many years of teaching practice in higher education with a focus on continuing education, but it can be seen as useful in any higher education that works with transformative learning and identity formation. It is developed with the hope that this visibility can contribute to students and instructors achieving an increased understanding of working reflexively with actions and recognitions during and after education.

The above considerations lead us to the following problem statement: *How can systematic reflection using our model 'Fundamentals of systematic reflection in practice' contribute to students' professional identity formation and awareness of learning?*

The pilot study on the Diploma in Leadership aims to emphasize that reflexive practice learning is not just an academic exercise but a practical approach that can have a profound impact on students' development and effectiveness (Horn et al. 2020). By integrating the didactical model '*Fundamentals of systematic reflection in practice*' as a central part of education, we can help students navigate a complex world with greater confidence, competence, and reflexivity, contributing to their lifelong curiosity and exploration of their own practice (Bundgaard 2024). The focus of this article is to analyze and discuss the relationship between reflexive practice learning and professional identity formation through the application of a reflection model designed to make reflection applicable and practice oriented.

Method

As described above, the use of reflection portfolios had two purposes in our pilot study. One purpose was as a learning tool, where students collect documentation and independently generate reflective writing about their learning process to create and maintain a written situated reflective practice that can stimulate clearer and deeper awareness of their own learning (Moon 2006; Zubizaretta 2004). The other purpose was to provide empirical data for our pilot study.

To closely follow the students' development throughout the module, with a particular focus on their reflections, experiences, and actions in practice, they were carefully instructed to collect all their notes, documents, reflections, and artifacts in their individual digital reflection portfolios. With written consent from all students participating on the module, we, as researchers, had access to their reflection portfolios, allowing us to continuously monitor their development and responses to the reflection tasks and learning activities they were given both in and outside of class. The purpose of using data from all the students' reflection portfolios is to provide a deep insight into their reflections, experiences, and actions from practice, which together form the foundation for their professional identity formation. To supplement our data from the 26 reflection portfolios, we also conducted semi-structured interviews with 4 of the students to gain a more nuanced insight into how each of them experienced working with the reflection portfolio and learning processes (Brinkmann & Tanggaard 2020). These were selected with

the aim to secure the diversity of professions within the class, and were selected before the beginning of the module. To ensure direction in the interviews and elaborate on the themes that cross all students' reflection portfolios, we prepared an interview guide. It is important to note that the interview guide was used solely as a tool to maintain an overall direction in the interviews while allowing students to freely answer questions and explore new interesting perspectives in the conversation (Brinkmann & Tanggaard 2020). As we investigate the relationship between students' systematic work with reflections and professional identity formation, we let the empirical data from the reflection portfolios and interviews be equally included in the following analysis.

The data analysis followed the principles of focused content analysis, which lies between open, exploratory content analysis and closed categorical content analysis by adopting an investigative yet focused approach to the empirical data (Hsieh & Shannon 2005). The aim is to develop and qualify a reflection model that can contribute to making the connection between learning, reflection, and professional identity formation visible. The following analysis focuses on both semi-structured interviews and reflection portfolios as a reflection technology that can enhance students' deep learning skills (Brown 2002; Moon 2006). The analysis also aimed to clarify how the use of the reflection portfolio impacts students' awareness of their own learning and professional identity formation. The focused content analysis was thus based on an understanding of reflection portfolios as autobiographical texts intended to present learning from an individually situated experiential perspective. In processing our data, we anonymized the students, subsequently reviewed all reflection portfolios, and listened to the interviews multiple times to strengthen the insight and understanding of the generated data.

The content analysis is based on a reflection model (Fig.1) developed in relation to the pilot project as an analytical and didactic tool to support and develop students' awareness of their own learning and reflexive skills in practice. The reflection model contains four mutually constitutive levels with a temporal dimension. The levels are named: learning moments, recognition, transformation, and professional identity, which will be further described in the section '*Reflection and Professional Identity Formation*'.

The Importance of Reflection for Identity Formation During and After Education

Reflection plays a crucial role in the formation of professional identity, and when the professional decides to pursue a specific interest within a professional field. Whether it is when the educator evaluates conflict mediation between children in kindergarten, when the nurse finds the best and most caring way to insert an IV in a patient, or when the school leader creates the best conditions for children's learning by working qualified with teacher's team collaboration. In these examples, reflection occurs both before, during, and after the professional action, containing equal parts experiences, ideals, and actions, each of which can appear complex and difficult to handle.

In professional and continuing education as well as in higher education, there is no doubt that reflection contributes to qualifying professional judgment (Horn et al. 2020; Schön 1987). But as with many other phenomena, one often falls short when trying to create frameworks in which students can develop a sense of what reflection consists of and contributes to in professional practice.

In this article, we lean on a definition that highlights reflection as an active and conscious process (Dewey 1910), as well as a learning and changing process (Argyris & Schön 1978), which gives the individual the opportunity to adjust in action and through the next action (Schön 1987). It is thus a process that both internalizes and externalizes, where the individual depends on immediate feedback and experience formation as well as aspirational ideals and knowledge to improve the next action (double-loop learning) (Argyris & Schön 1978). In the following, reflection-in-action and reflection-on-action will be particularly addressed as the basis for developing a model that can support reflexive practice learning during and after education.

Reflexive Practice Learning and Professional Identity

Education is often associated with transformative learning processes, as students – whether they are young individuals coming directly from high school or professionals with years of experience – aim at a specific field and educate themselves to become a qualified part of a professional community. The reflexive learning process is linked to professional identity formation, contributing with a focus on identity being formed

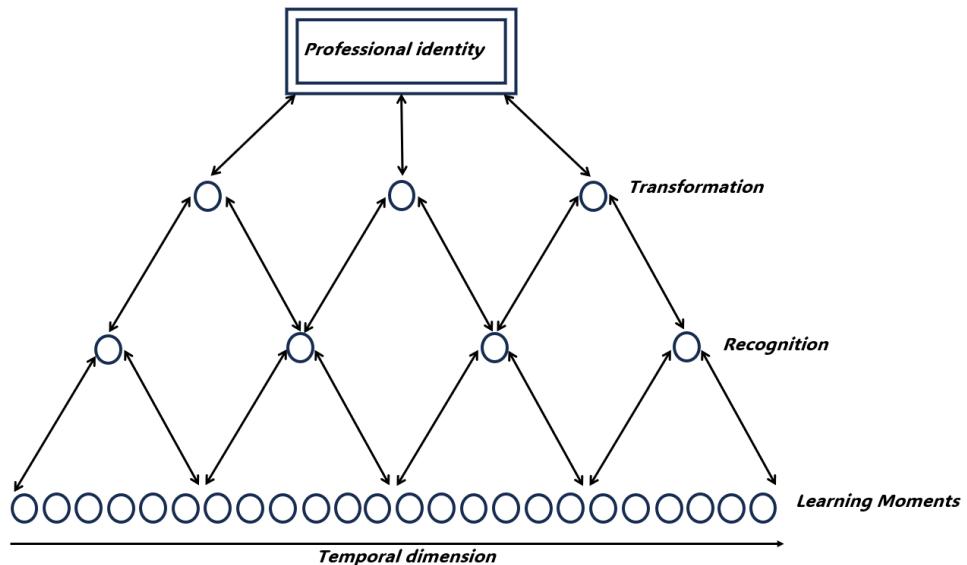
through individual and collective processes, navigating between different roles and perspectives (Caza & Creary 2021; Mezirow 1990). This attention is incorporated as the basis for developing a model that contributes to systematic reflection through thick descriptions of moments in which the individual has an increased sense of significant realizations (Manen 1990).

The following model is an attempt to scaffold the movement from the initial 'aha' moments to more conscious and transformative reflections that can be linked to professional identity formation processes. The model should be seen as a scaffold that can help capture momentary wonder or curiosity and, through reflexive work, incorporate these moments as tangible parts of a reflexive professional identity formation process.

Reflection and Professional Identity Formation

The model relates to the individual's acquisition process and should thus be seen as a possible framework for the internalization of experience and learning, which can support both the taxonomic progression of teaching and education and professional reflection in a complex reality. Thus, the model seeks to capture reflection as a complexity-reducing process that can contribute to deep and qualifying insights into one's own acting practice with a view to refining and changing it.

Figure 1: 'Fundamentals of systematic reflection in practice' by Bundgaard & Johansson



Fundamentally, the model incorporates movement in all points (arrows in both directions), aimed at making visible what I know now, what I want to know, or what I am curious about. The model should not be seen as static but as consisting of an eternal movement between action or moment and values and ideals as the essence of professional identity. Ideals are renegotiated or fall through actions in practice, after which they are qualified or new ones emerge.

In the following, we will analyze the model's four levels and provide examples of how students in the Diploma module Personal Leadership have used the reflection levels to become aware of their own learning and development throughout the course. Each level is qualified with a theoretical learning perspective.

Learning Moments

Learning moments are based on Illeris' definition of learning as "any process that leads to psychological changes of relatively lasting character, which are not due to biological-genetic factors such as maturation or aging" (Illeris 2009 p.32). Moments are thus an attempt to capture students' experiences through activity or action as the first immediate signs of

learning and an occasion for reflection (Dewey 1938). They can further be described as what Jerome Bruner calls critical moments, which contribute to increased curiosity, without necessarily having other contexts than being a sense of an 'aha' or a new understanding (Bruner 1971). It is thus the student's first sense of moving consciously, without necessarily having a sense of why, where, and how, and what larger context this can be placed in.

It is important for learning moments that they are not necessarily significant in themselves and that they are only given value when they are given context and direction through reflection. Examples of these moments include notes for reading and teaching, as well as exercises aimed at linking theory and practice. This form of moments is individual and spontaneously arising, as they depend on the individual's experience and theoretical knowledge.

Another example is the consciously scaffolded moments, which can be seen as an occasion to create collective awareness of learning and development. In the Diploma module Personal Leadership, the overall goal is to: *"Develop leadership identity and practice personal and professional leadership professionally through reflection, communication, and action in relation to the organization's needs and task resolution"* (UCN Study Plan 2025). As one of the first activities, students were introduced to an exercise where we asked them to set an intention for the development of their leadership identity and plant a seed in a paper cup. The seed was to be watered and cared for during the module and finally brought as a picture and as an occasion for a concluding and summarizing reflection. Several students mentioned during the course that this small action seemed a bit silly at the moment, but by being forced to care for the plant, they were also forced to revisit their starting point, which gradually developed into a guideline for the development of leadership identity and a reminder of where their journey began. In reflection and revisiting, this collective learning moment provided an opportunity to become aware of their own development and initiated transformation into becoming leaders.

Recognition

The recognition level contributes with a view of the coherence or lack thereof of learning moments. Through reflection and analysis of the moments, students assess their budding signs of learning and development with a how and why. This with a view to creating meaning and under-

standing of the learning moments and becoming aware of what changes are beginning to take shape. Here, Bruner's description of recognition as a dynamic and continuous process, where knowledge is formed by discovering and understanding the information contained in experiences (Bruner 1971), is related. Additionally, this layer is related to reflection-on-action, which contributes to creating deeper meaning and knowledge about actions (Argyris & Schön 1978; Schön 1987). This layer creates curiosity about the intentionality of learning, and reflection contributes to meaningfulness and knowledge formation, and thus selection of what is relevant now, what should be further investigated or explored through the next actions.

A student captures the recognition level here as an observation of conversations in the room and the knowledge she has acquired through the course:

“My experience is that it is important for the individual – some more than others – to point out the values that we each have. It is also something incredibly tangible, as it is something that, for most, has followed them for large parts of their lives. At the same time, I listen to the fact that values are the cornerstones of who we are and the way we act, but at the same time, there is an understanding that values and their practice are dynamic and are adjusted according to the situation one may be in.” (Reflection portfolio – Inge 2025)

In this example, recognition is framed as an analysis of learning moments and an attempt to construct knowledge about the significance of values for leadership, as both something static and something flexible and dynamic. The student is in the process of establishing a new understanding of the theory and its significance for her leadership identity. She then directs her attention to a desire to expand her knowledge: *“I need to know more about the theoretical background and the right tools to act based on different scenarios that I may encounter on my way in the future and with the tasks I handle daily.”* (Reflection portfolio, Inge 2025). Thus, there is a need to explore new learning moments for this student to explore how she connects her theory with qualified actions in her practice.

Transformation

This level refers to the critical reflection on actions and recognitions that lead to deeper learning, affecting the student's underlying assumptions, values, and ideals (Mezirow 1991). From here, new and more fundamental changes in action and development opportunities can be defined. While Mezirow describes transformation because of a disorienting dilemma, the understanding here is closely linked with reflection-on-action(s) or recognitions, which lie in the model's preceding layer. This layer refers to deeper reflection (triple-loop learning), which prompts questioning the fundamental values and assumptions that characterize and shape the actions made visible through learning moments and recognitions (Argyris & Schön 1978).

An example of the transformative level is a student's reflection on the recognitions that resulted from conducting interviews with colleagues about their own leadership style.

“I think what has affected me the most in relation to my leadership identity is the interviews. The mirror that was held up to me is quite impactful. Trying to find weak and strong sides of oneself as a leader when you haven't been in the field for long is quite a bumpy ride.” (Interview – Naja 2025)

Naja mentions the interviews as an occasion for recognition and the formation of meaningful patterns that partly explain her position as a new leader and partly give her insight into the foundation her leadership stands on. She continues her reflection with a description of the core values she has become aware of, which lead to new and more focused actions in practice. *“I can feel that I am now moving differently in my leadership. I am concerned with how my values can become visible in my work as a leader and how I can use them to navigate paradoxes and conflicts.”* (Interview – Naja 2025). In this, Naja refers to several learning moments, which include both the data she has collected as part of the module's activities and the reflection on the module's theoretical framework, where value-based leadership and paradoxical leadership have been introduced.

Another student reflects on transformation based on actions in practice. *“I can feel that I am practicing taking more responsibility. Dare to speak my mind. I am becoming more aware of my values in my life and my work life, and how I want to use them in a (perhaps) future leadership position.”* (Interview – Hans 2025). Here, the impact of deeper reflection

on the desire to explore one's own practice based on values is highlighted. Thus, this deeper form of learning can prompt the student to define curiosity and motivation for exploration. This level also opens for the visibility that the student begins to act and behave reflexively (Horn et al. 2020).

Professional Identity

The final level represents the formation of professional identity, which covers the student's self-understanding and perception of themselves as a professional actor within a specific profession (Eteläpelto et al. 2014; Tajfel 1978). Through continuous reflection on recognition and transformation, the student develops a strong sense of their professional identity, integrating their knowledge, skills, values, and ideals. Here lies access to a deeper understanding of the professional self and the actions that become meaningful in a specific context. This level, like the other layers, consists of both internalization and externalization, directed towards the context the student is part of, and which the actions must be adjusted to, despite the newly increased knowledge of one's own abilities and curiosity (Wenger 1998). The awareness of professional identity allows the student to engage in professional communities with an increased understanding of what can be contributed. Here, attention is also increased on the drive to explore new areas and knowledge with a deep understanding of which ideals should form the basis for qualified exploration of new actions and experience formation.

A student touches on this level with the following reflection in their reflection portfolio:

“Balance – is another value that has been ingrained in my memory from my upbringing, where possessing balance is equated with opportunities and a normal and good life. It is also something I have carried with me in life on both a personal and professional level, where the balance between work/family is crucial for whether I function in everyday life.” (Reflection Portfolio – Grete 2025)

In this example, it becomes clear how the student takes the time to reflect on fundamental assumptions and values through a reflection on the phenomenon of balance. Here, it relates not only to learning and development through the module but also includes experience from upbringing

and professional and personal development. The example underscores how working at this level is not everyday reflection but functions as a meta-reflective and in-depth analytical level that provides insight into the larger contexts.

This level opens for increased awareness of the meeting between ideals and action, thus creating the potential for ideals in this meeting to fall and new ones to arise as guiding principles for new actions. A process that often seems frustrating and complex, as its purpose is to influence the individual's fundamental perception of themselves, the world, and their professional actions therein. Thus, this is related as a nuanced layer of the transformative level, where learning contributes to changes in professional identity.

In the education of future leaders as reflective practitioners, this level is reflected through a subordinate competence goal: "*The student can identify their own learning needs and plan their own competence development to strengthen personal and professional leadership*" (UCN Study Plan 2025). In teaching, this is scaffolded through the students' development of a leadership foundation, which aims to capture their meta-reflection on their professional identity as leaders.

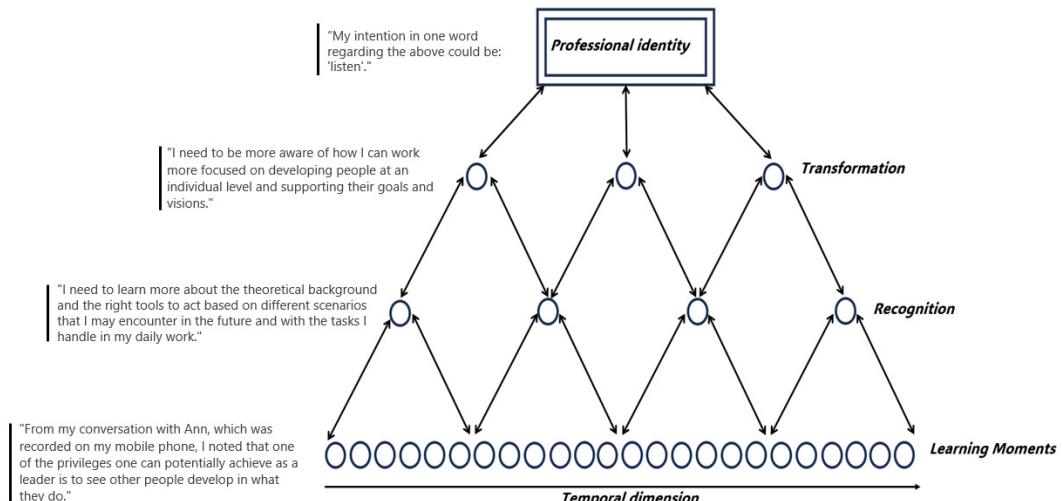
"My leadership foundation's primary purpose is to create harmony between people and the organization in the goal of creating a common direction where there is also room for development, a good working environment, and ambitions. [...] I intend to have integrity in what I do and what I expect from others. I will treat my fellow human beings with respect and expect the counterpart to respect my choices and the direction I set. In this way, it should ensure that my team – and the organization – optimize the basis of existence and that employee well-being is in balance." (Leadership Foundation – Andreas 2025)

In the above excerpt from a Leadership Foundation, the student's reflections on their professional identity as defining for actions in practice are made visible.

As the analysis has shown, the four levels provide an opportunity to develop, stimulate, and nuance reflection and actions among students, which also strengthens and develops their professional identity formation. Using the model didactically in education can support students'

ability to independently systematize and develop their reflexive practice and thus strengthen the focus on lifelong learning. In the figure below, we have included quotes from one of Anette's coherent reflections from her reflection portfolio.

Figure 2: Quotes from Anette's reflection portfolio



In her reflections, she systematically uses all four levels, enabling her to identify what she should focus on to develop and sharpen her professional practice and actions. By increasing awareness of how the levels contribute to the exploration of practice and the development of professional identity, the model can also help students like Anette use the model as an opportunity to approach their work life reflexively after completing their education.

Didactic Reflections

By giving reflection a materiality, students become more aware of the potential of identity work and thus how reflection can contribute to awareness of agency and the development of practice. The model is an attempt to make the connection between learning, reflection, and professional identity formation visible and thus a proposal to become aware of what it takes to use reflection as an identity-forming element throughout life.

Here, it is essential that the instructor actively participates in the application and activation of the model through tasks, feedback, and reflection tools that make it possible to create a system around the reflection work and help the student find their own way in what contributes to meaningful and useful reflection. The model thus provides a basis for creating a system where the student must find their individual way of working with the different reflection levels.

In the didactic considerations of the reflection model, the instructor must have a particular focus on making the levels relatable and applicable. Here, it can be useful to use the following questions as a reflection framework, which gives rise to moving thinking from level to level. The following questions are designed to internalize processes from observation to reflection and externalizing processes that create coherence between reflection and action.

Table 1: Levels of reflection (Bundgaard & Johanson 2025)

Reflection Level	Questions
Learning Moments	What are you focused on? What gives rise to an 'aha' moment? What do you want to know more about?
Recognition	What connections do you see when you look at learning moments within a defined period? What knowledge can you use to understand the connections in your recognitions? What do you want to change or do more of?
Transformation	What concepts and perspectives underlie your recognitions? What do your recognitions tell you about your way of learning and developing? What do you want to explore more and act on?
Professional Identity	What values characterize your professional identity when you look at your learning and development over the last period? What ideals inspire you in your professional work when you look at your professional engagement? What do you want to do more of or seek more knowledge about?

Concluding Remarks

When discussing reflection in an educational context, it often becomes unclear approaches, which can make it difficult to define what actions are needed to make reflection a qualifying process. This model stems from a curiosity about how reflection can be made more tangible and accessible as a tool that supports education and the formation of a professional identity and can be a way to maintain reflexivity and curiosity about one's own practice after completing education. Thus, it could be interesting to further investigate how the model can support reflexivity with a focus on identity formation and lifelong learning after education or on the way to the next education.

In the study, we have become aware that the reflection model works best when it is didactically activated through scaffolding with a focus on clarifying the significance of the different levels for reflexive practice. We tried to accommodate this experience by giving all students access to Class Notebook with a predefined system in which they could work with the reflection model. However, it proved challenging as the IT system was not stable and sometimes deleted the students' material. The model invites the instructor to work exploratively with scaffolding the different levels and can thus be an invitation to develop an exploratory, reflexive practice around their instructor identity.

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Returning from Practice to Theory to Practice too

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Abstract

Contemporary aspirations of higher education emphasise various conceptions of employability and ready-to-work students. This is often included in education as authentic problems parting from prospective vocational practices or different types of apprenticeship, thus reciprocally enriching theoretical insights with practical actions for the becoming novice, student. Practice becomes a space entangled in specific pedagogical approaches and considerations. However, the opposite also happens, practice returning to education, where practitioners with years of vocational experience return.

This paper presents a case study of an educational Master's program consisting of both students continuing the education from a bachelor program, and practitioners returning to education. Based on Dewey's experiential continuum, we investigate how we by non-intrusive means can aid students' (N = 28) in reflecting on their past, present and anticipated future in relation to the educational program. The data consist of short, personal snapshots containing short personal characteristics, motivations, and career prospects written by the students on post-it notes (N = 311). The post-its were collected on the first day of study through a workshop.

The snapshots show a wide variation in students' rationales and ambitions, such as technical and generic competence development, modes of studying, aspirations to change career and profession, but also personal aspects such as family life. A common denominator is a shared story about ambitions to change current careers or open new avenues for employment and professional practice.

Keywords

Problem-based learning, ways of experience, experiential pedagogy

Introduction

Often universities are considered transitional or liminal spaces (Savin-Baden, 2016), where students through rites of passage and years of copious study finally emerges as professional practitioners. It is a space of cultural and social traditions and rules (Meehan & Howells, 2019). It is also a space and place of multiplicities: materials, experiences, people with different 'stories-so-far' (Massey, 2005).

In this paper, we want to draw attention to a space of interrelations of stories-so-far and individuals' aspirations for their education. This is born out of a practical problem concerning students' sense of belonging in an educational Master's programme consisting of students with different educational backgrounds and professional experience, where both epistemic beliefs and professional identities are challenged. Practically, in our daily teaching and supervision, we see different types of knowledge being valorised while others are not. Drawing on Schön (1983), we find troubles in the intersection of educationally developed technical rationality and practical, professional doings, and for returning practitioners these troubles are often bound in epistemological (and perhaps ontological) breaks too: "*I was a [insert occupation], I do not want to be/do anymore, which is why I am here.*" For some students such breaks even nullify previous experiences that otherwise could have been beneficial scaffolding schemas for learning. According to Dewey (2013), habitual beliefs and expectations influence *what* is experienced, and such ways are set by social factors, by tradition and education (p. 39). Hence, students' previous experiences are a pivotal factor in a space in constant flux, and while we plan means and ends of education, ways of experience are not isolated to the formal space of educational institutions, practicum, or the individual student alone, but rather a totality of the everyday life (Lefebvre, 2014). To this we might add a careful remark from Lefebvre (2014), who writes that reflection is not an undistorted mirrored picture, but a 'movement' prone to distortions based on everyday life, ideologies and epistemic beliefs. Addressing reflection and reflexivity as part of educational practices might then require us to extend the act of reflection to include what Dewey denotes as "*culture*" (Alexander, 1987) or Lefebvre (2014) "*a critique of the everyday life*" to see the student as

more than someone dedicated to studying, not only a person belonging primarily to the university, future profession – or metric (Biesta, 2010).

In institutions practicing modes of inquiry-based education, such as Aalborg University (AAU) where this case study was conducted, students spend a substantial part of their time doing projects, emphasising a high degree of participant-direction and self-directed learning (Boelt & Clausen, 2023). In such a place and space, this also result in experiences of invisible pedagogy (Bernstein, 1977), self-directed co-construction of curriculum and negotiated practice among peers, teachers, and supervisors (Boelt, 2023; Clausen, 2023). Developing educational activities as purposefully driven towards fostering competent and ready-to-work graduates are often framed as pedagogical interventions geared towards post-modern, evidence-based, measurable outputs (Biesta, 2010), leaving little ambivalence for the inherently uncontrollable risks of education (Biesta, 2016; Rosa, 2020): what works today might not work tomorrow. ‘Space is a product of interrelations,’ notes Massey (2005, p. 9) in the opening proposition, of a contemporaneous plurality always under construction.

Tensions and belonging

As already hinted, our paper takes its point of departure in tensions experienced with a heterogenic student cohort, some continuing their movements from bachelor to Master’s programme and others returning with years of professional experiences. Diverse cohorts are reduced to ‘students’ or learners, a vague nodal point devout of individual characteristics and contexts (Zapp, 2019), where the movement through space and place is one from a to b, b being graduation (Gourlay, 2015; Gravett & Ajjawi, 2022). Gravett and Ajjawi (2022) remarks that increasing heterogeneity ought to influence our conception of student belonging that typically omits racial, gendered and classed perspectives. Belonging at universities is reduced a uniform experience exemplified by the arch-typical on-campus, full-time, participating student, emphasising belonging in relation to academic performance, retention and uniform conceptualisations of psychological safety (Meehan & Howells, 2019).

Gravett and Ajjawi (2022) suggest broadening the scope, introducing Massey’s (2005) stories-so-far, noting belonging is a nomadic and ongoing process. By fixating students’ process of becoming, a movement from student to graduate, we risk depriving students of their stories-so-

far and the experiences that influence the ways interactions are had and interpreted. Massey's (2005) notion thus highlights the importance of experience as a constituent part in the reciprocal creation of a relational space in constant change. In education, such changes can be caused by overcoming threshold concepts regarding knowledge and practice, and a subsequently transformed way of understanding disciplines, like cultural rites transforming the individual – there no going back (Savin-Baden, 2016), only continued being-in-the-world. Thus, belonging is not an event, but an ongoing process, a prolonged initiation or rites of passage into a discipline (Bernstein, 1977). The intertwined process of being, becoming and belonging is also highlighted by Meehan and Howells (2019), who find both curriculum, staff, peers, and environment play pivotal parts in a constituent whole. In this paper we draw inspiration from Meehan and Howells' conceptual framework based on three, broad question concerning being, becoming, and belonging: *Who am I, who will I become, and how will I fit in?* (Meehan & Howells, 2019, p. 1378).

Our initiating research question is: How do students describe themselves and their motivations for enrolling in a Master's degree programme, and in what ways may these descriptions and motivations influence their experiences of education?

Inspired by Dewey's (1978) experiential continuum, his aims and ends of activities (Dewey, 1997) and a peripheral positioning of the theoretical bricolage presented below, we conducted a small case study during the first day of study with new students enrolled at a Master's programme at AAU.

The theoretical bricolage: ways of experiencing stories-so-far

In this section we want to outline the ideas informing our method and analysis. While our small case study is an isolated moment at the beginning of a Master's programme, we draw on theories emphasising continuity, temporality, and growth. As we noted above, being and becoming are ongoing processes, emphasising a past in the present moment, while prospective futures emerge through open-ended interrelations of stories-so-far.

We draw on Massey (2005) and Dewey (1978, 1997) and their perspectives on continued experience where the future is open and an out-

growth of present actions and interactions, while informed by experiences that are educative (Dewey, 2015, p. 37):

He has rendered himself more sensitive and responsive to certain conditions, and relatively immune to those things about him that would have been stimuli if he had made another choice.

Massey's 'stories-so-far' are intended to capture change occurring in phenomena from a temporal perspective. Such phenomenon can be a living thing, scientific attitude, a collective and more. More precisely 'story' is the history, change, movement of things themselves (Massey, 2005, p. 12). Different trajectories of stories exist simultaneously, interacting always in openness – there is no a priori fixed space. But there is a 'here' where spatial stories form conjugations of intertwined histories (Massey, 2005, p. 139), i.e. some shared historical process that in our case leads students to a particular education.

According to Dewey (2008), aims emerge as outgrowths of existing conditions as part of the continuity of human activity. We draw on the experiential continuum to emphasise the presence of a past and future in the present, where experience is not primarily *antedate*, but immediate and mediated pointing forward enabling growth (Alexander, 1987).

Dewey writes in *Experience and Nature* (2013) experience 'is of as well in nature.' We do not experience *experience*, but things interacting in certain ways. However, experience is often reduced to the act of experiencing something, but the object of experience is more than the given and includes "*a surrounding cluster of other qualities revived imaginatively as "ideas"*" (Dewey, 2013, p. 43). Particularly the former, the immediacy of how, is also noted by Dewey, who in his later works would jettison the word *experience* and replace it with 'culture' (Alexander, 1987, p. 70). Much like the inter-relational ontology of space outlined by Massey (2005), Dewey's 'culture' includes artifacts, activities, customs, beliefs, dispositions, morals, arts, knowledge and world-views: the shared life of human beings '*experienced in an indefinite variety of ways*' (LW1, p. 362, in Alexander, 1987, p. 71). Hence, to Dewey, experience is substantially more than empiricist direct accounts of realty and involve a wide variety of elements all contributing to a whole:

that the present moment of experience is a dynamic orientation to a whole process; it is an attempt to organize that process into a unity (Alexander, 1987, p. 76).

It is worthwhile to distinguish 'experiencing' from an experience. We experience some-thing(s) all the time, but some experiences stand out because of specific qualities that separate them from others, making them singular units for consummation. However, such experiences are also part of a continuity of interactions, aims and ends in view for later experiences, making them 'problematic' (Dewey, 2008).

Research context and methodological considerations

Our research takes place at AAU where a systemic integration of problem-oriented and problem-based learning is implemented (Feilberg et al., 2023). Much like other institutions that adopt an institutionalised pedagogy, several local interpretations of general learning principles exist (see for instance Feilberg et al., 2023 depiction of different interpretations of PBL at AAU). Such general principles are malleable, while also undergoing continued revision, and the latest iteration at AAU is supplemented by additional text addressing principles for digitally supported PBL scaffolding competences needed 'in a modern world'.¹ The core tenets of AAU PBL model is that the problem is the starting point for learning; project organisation defines the temporal aspect and activities; courses support project work; cooperation; exemplary learning; students have a high degree of autonomy and responsibility for their learning (Boelt & Clausen, 2023). Typically, students spend half their time (roughly 15 ECTS) on project work, culminating in the final capstone project of 30 ECTS.

Methodological considerations

Our small case study involves students starting on the Master's programme where we do our teaching and supervision and took place the first introductory day of study. The student cohort is diverse regarding both professional and personal experience and in phases of life. Some students continue directly from their bachelor program whereas others return after several years of employment and with other commitments such as family. In the cohort starting in 2024 there was 39 admissions with 15 different educational backgrounds and wide variety in professional and academic experience.

¹ More information available here <https://www.en.aau.dk/about-aau/profile/pbl>

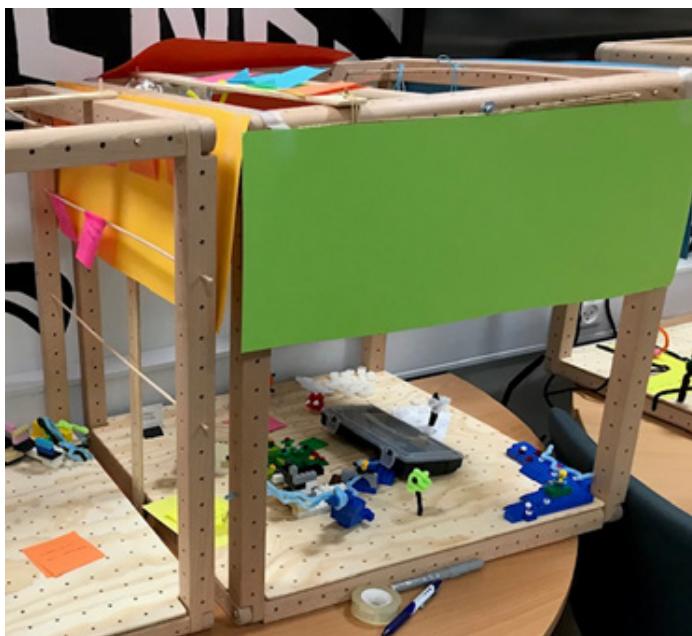
To make students aware of their experiences and traits that might influence ways of experiencing, we conducted a small workshop and asked students to produce short statements relating to three broad questions:

1. Who am I?
2. Why am I here?
3. How will I contribute to project work, and what do I expect from peers and myself in such contexts?

To initiate the dialogue each group would start of by piecing together a Tinker Cube, which is square with no walls. Figure 1 shows a Tinker Cube used in a different project. Once statements were written, post-it notes could be placed anywhere on or in the square for further discussion and categorisation. For each of three clusters of question, who, why and how, the groups had 5 minutes to individually write statements, 5 minutes to present them to peers, and 10 minutes to arrive at the shared synthesis.

The workshop served two purposes, one being primarily social, making the students talk and socialise before the semester starts in earnest, and second to make the students conscious of each other's phases in life and academic aspirations. As Dewey (1997) notes, any group of people can get together, but forming a sense of community requires dialog to establish a shared direction. The three questions were the initial framing of their dialogues, and to maintain an informal and open dialogue among people who might have met for the first time, we decided to collect short statements concerning each question on post-it notes.

Figure 1: Tinker Cube used in a previous semester project



Each post-it were collected and included in a descriptive coding process (Saldaña, 2009) to categorise the statements into similar themes. The initial coding resulted in 34 constructed themes that were aggregated and combined in a second iteration of refinement (Braun & Clarke, 2006) presented in the next section.

Though we write students 'reflect,' what really counts as a 'useful' reflective statement? Keogh, Boud and Walker (1985) suggest that reflection is returning to a situation and observing it anew. While we would like to think that the students return to a situation, the small statements concerning ambitions, insights into parenthood, educational background and so on hardly qualifies as a returning-to-a-situation, but 'just' an act of individual positioning, primarily serving as a mean to become aware of one's situation compared to other's.

Limitations

We concur that other means of data collection such as in-depth qualitative interviews either individually or in groups will provide richer answers (see Clark et al., 2016), but our curiosity as to whether such

short statements on post-it notes might even tell us something about the students got the best of us, and could start a process of becoming more attuned to our students' being and becoming.

For instance, it would be valuable to know how the interrelation of studying and parenthood might influence each other, and also how such perspectives might affect the interaction among peers with different prerequisites for participation in the educational program. This will require a different research design including a temporal aspect sensitive towards the personal and everyday life.

The broad questions asked are culprits, too. A more focused workshop centred on a specific topic concerning educational experience might be of more direct and applicable value – i.e. what type of educational experience has been educative to you. However, we find the broad and open-ended approach serve as a qualifier for future research into experiences potentially fostering students' sense of belonging.

Findings

The descriptive coding process led to construction of 10 themes embedded in *who*, *why* and *how*. Table 1 summarises constructed themes and parent categories. Our aim is to note statements for each theme to gain a richer picture of the students, who they are, their motivation for studying, and what they expect of their peers. We will supply additional reflections from our daily interactions with students to address and expand some of the points presented in the following section.

Table 1: Themes for who, why and how

Who are they?	Personal life; educational background; vocational experience;
Why are they here?	Prospective career; personal development;
Contributions to teamwork	Expectations to peers; personal characteristics; study competences;

Who are they?

‘Who the students are’ is mostly based on short statements related to aspects of their personal life, relationships, family and where they live. As already hinted, the students are different phases of life, and most students use family relations to describe themselves. Some students are parents, others are brothers or sisters, some are single without kids:

“Three kids, 2, 8, 9 years old,” “No kids,” “Aunt to 5.”

Using relationships to describe themselves entails an ‘enlisting’ of others to describe certain ways of being and might also point to factors affecting future participation in education (Gravett & Ajjawi, 2022). It is interesting to note, that some students who do not state parenthood instead writes ‘aunt’, ‘uncle’ or ‘pet owner’ as relations, suggesting some efforts towards a sense of alignment in values found in relationships among students.

Several students position themselves by their educational background and previous employment. The variation in educational background is not surprising and confirm what is already known, representing both university BAs and PBA, the latter predominantly by public school teachers. Vocational experience is quite divergent, ranging from relevant parttime study job to fulltime employment. One student’s statement informs us of 15 years in professional practice whereas other peers note 3–4 years as practicing teachers in public schools:

“Teacher, educated in 2021,” “Nurse,” “Software developer,” “Teacher for 11 years; math; physics; history”

It is fair to assume that being in different phases of life will influence the individual student’s trajectory through education. Gravett and Ajjawi (2022) and Gourlay (2015) emphasise how participation in education is becoming less homogeneous as student populace is increasingly heterogeneous, and individual priorities subsequently changes.

Why are they here

The previous section showed how relationships, educational background and employment are used to delineate each individual student, a construction of subject-ness (Biesta, 2016). Such statements provided little

information to us as teachers and researchers but can be valuable information to other students in relation to alignment of expectations for future personal engagement.

Why students choose the educational programme is on the other hand more explicitly articulated by students. Students' statements show two themes as to why they are here: One related to potential careers and one of personal development.

Several students state that the Master's programme with its ICT focus will provide new opportunities for their career trajectories. Some students state "cand.it = job opportunities", "IT is the future" and the majority state job-security as a reason why. 'ICT' and technological development is central element of the shared spatial stories of society, and so are descriptions of precarious and volatile job market. Such shared stories fused in students' statements which at the core revolves around achieving some sense of security. The 'surrounding cluster' of culture might then influence ways of experiencing, as Dewey noted (Alexander, 1987).

Other students emphasise ambitions to change an existing career:

"Changing career; no more care work; every door is open," "Change of industry," to "No longer be a teacher (identity crisis)," and "No longer be a physiotherapist."

Hence, education is to some a means enabling vocational mobility. Why students wish to alter existing career paths other than identity crisis only few hints are found. One student note that the societal attitudes towards health care workers are tiresome, while another remark that the existing education and employment were only temporary steppingstones. For the former, Dewey's 'culture' point to the mesh of an interacting and 'shared life,' influencing the ways individual experiences are had (Alexander, 1987).

Most of the students' statement regarding why they are here also revolves around what kind of job they want, and a common thread are ambitions to work with project management and leadership. Furthermore, improvement in work-life balance is stated by some students, hoping a different job will provide 'normal' working hours and higher salary.

Few statements address what seems coupled with inclination towards improving existing conditions for a specific group of practitioners:

“Want to develop/implement ICT solution in health care,” “Improve conditions in public schooling,” and “Change typical workflows in pedagogical jobs.”

What ICT solutions and conditions need improvement is not stated, but it is pointing to a perceived value and authority of education and knowledge, and the aspirations to change practices.

Student statements also show other perspectives than those related to future careers and includes attitudes towards personal development that is not explicitly linked to careers, although such perspectives may figure in the background. Some students simply state:

“Academic challenge,” “Academic and personal challenges,” and “I like a challenge.”

Some students’ statements concern timing, and only few addresses learning subject matter of the educational program as a motivational factor, but in relation to an employability perspective it appears that students overwhelmingly expect a degree to open new avenues both personally but mostly professionally.

Contributions to teamwork

The majority of students statements concerning expectations to peers centre on developing alignment, equality in level of contributions, mutual trust and respect, and creating a sense of wellbeing. Previous research has also confirmed such considerations as central components for students working in PBL environments (Boelt, 2023). Describing themselves as members of a team, most use positive adjectives such as:

“Creative,” “Flexible,” “Honest,” “Empathetic,” and “Systematic,”

This is perhaps not surprising given the students met each other only hours prior, and we expect few would characterise themselves as a typical social loafer. One student state that the person is an ‘overthinker,’ which by some could be interpreted as a subject potentially impeding a project’s progress.

Few students have noted how they contribute to teamwork with relevant abilities. Those who have, highlight project planning and structuring the written report. One student states:

“Strong ‘on’ the writing-parts and grammar + overview and connections.

What the “writing-parts” signify we do not know. It may be related to the totality, structure or perhaps even personal pleasure found in writing.

Discussion and concluding remarks

Our aim was to research how students describe themselves and their motivations for enrolling and how such descriptions and motivations may influence students’ ways of experiencing education. In terms of how they describe themselves in relation to family, educational background we find the variation we expected based on prior experience and information given upon enrolment. This reaffirms the picture of a heterogeneous student cohort constituted by individuals in different phases of life (Graveet & Ajjawi, 2022). Parenthood, for instance, is a shared story-so-far among some students, whereas it for others may be a story-yet-to-come, and one we have seen affecting priorities and ways students experience the educational program. However, how students work towards their goals and how everyday life affect studying is outside the scope of this small case study and require detailed research

The post-it notes provide a broad and general overview of students’ being, who they are, and their ambitions for their education. As to how students will fare in relation to lifelong learning only hints are given: Students return from practice to education to change careers, essentially highlighting education as a valuable vehicle to open new vistas. In such a perspective, lifelong learning is not only societal or capitalist aspirations but an existential trait resulting in a change person (see Jarvis, 2007).

The differences in profession and educational background also influence ways of experiencing, particularly we find a perceived schism between students holding a PBAs and BA. Schön’s (1985) technical rationality is a fitting depiction, where representatives from practice and theory meet in a shared space, but there is no continuum between practice and theory, it is the prioritised application of the latter to the former.

The stories do not become entangled. The stories, however, converge in students' statements as to why they are here. Most of the students imagine the Master's programme to open new avenues for professional and career perspectives. As some students noted, maybe ICT *is* in everything, especially in our shared sociotechnical imaginaries (see Jasanoff & Ki, 2015) and stories-so-far, and as such influencing the ways in which an educational program is experienced – will this content provide me a new job, if not why should I? There is a real risk such stories will commoditise education (see for instance Giroux, 2014), mitigating aims and ends as something emerging through action and not as ready prior to any inquiry. However, shared stories might be valuable, somewhat homogenic, entry point to understand heterogenetic ways of experiencing education.

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Bridging Learning and Practice: Exploring Transfer and Learning in Finance Internships

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Abstract

This paper explores how transfer and learning unfolds for students in professional bachelor's programmes during internships in a financial context. Reflective Practice-based Learning (RPL), which emphasises the interplay of experience, thinking, and action, is particularly relevant in a practice-oriented education, where students must bridge theoretical knowledge and professional practice.

Internships serve as key moments, offering students the opportunity to apply their academic learning in real-world contexts. However, transfer – the process of applying knowledge and competencies in new settings – does not occur automatically. It requires supportive conditions such as reflection, feedback, and opportunities for professional engagement. This study is guided by theoretical perspectives on learning and transfer, particularly drawing on Illeris' learning dimensions, Mezirow's theory of transformative learning, and Wahlgren's perspectives on transfer conditions.

While transfer has been widely studied in fields such as teaching and healthcare, the financial sector remains underexplored. This sector is shaped by distinct features, including complex regulatory constraints, varying degrees of student preparedness, and evolving professional expectations. This study investigates how students experience transfer during their internship, and how different conditions influence this process.

Through qualitative data from semi-structured focus group interviews conducted across three phases of the internship period, this study contributes to the ongoing exploration of RPL in an internship context. The

study contributes to understanding reflective and transferable learning in the financial sector by highlighting the role of motivation, psychological safety, and structured reflection. It underscores the need for intentional internship design in contexts where access and learning opportunities are not guaranteed.

Keywords

Transfer, Learning, Reflection, Transformative learning, Reflective Practice-based Learning, Internship, Motivation, Financial Education, Professional Identity, Psychological safety.

Introduction

Higher education continues to evolve in response to shifting societal demands, labour market transformations, and political reforms. In Denmark, the recent reform initiative “Prepared for the Future” (Uddannelses- og Forskningsministeriet, 2024) sets out to enhance the relevance, quality, and flexibility of educational programmes – particularly through a renewed focus on strengthening internship experiences. This calls for deeper insight into how internships function as arenas for professional learning and development.

In professional programmes such as the Bachelor of Financial Management and Services (FIBA), the internship plays a crucial role in shaping students’ professional identity and competencies. However, the process by which students apply academic knowledge in practical contexts – commonly referred to as transfer – is complex. Transfer does not occur automatically; it must be actively supported through reflection, engagement, and alignment between educational and professional practices (Illeris, 2011; Wahlgren, 2024).

This study is situated within the framework of RPL, a pedagogical approach that emphasises experience, thinking, and action as the foundation for learning (Horn, Pedersen, & Georgsen, 2021). RPL is particularly relevant in practice-oriented education and the interplay between theory and practice. Building on this, the study draws on Illeris’ learning dimensions (Illeris 2011), Mezirow’s transformative learning theory (Mezirow 1991, 1994), and Wahlgren’s perspectives on the conditions for transfer (Wahlgren 2024). These perspectives provide a theoretical lens through which to explore how students make sense of and act upon their learning in a workplace context. However, engaging in reflective

processes during internships is not only a matter of individual capability. Structural conditions such as how internships are organised, the nature of supervision, and the limited involvement of the educational institution during internship may constrain students' opportunities for ongoing and structured reflection (Lyster, Husted & Skovbjerg, 2023).

Despite substantial research on transfer in other fields such as teaching, health, and social work, little is known about how it unfolds in the financial sector. This sector presents unique characteristics: highly regulated environments, complex professional responsibilities, and strong expectations for both technical precision and interpersonal competencies (Finance Denmark, 2024). As noted by Aarkrog (2012) there remains a lack of insight into how transfer is best facilitated within specific professions. In the case of finance, this includes challenges related to e.g. limited task access due to compliance regulations, as well as variations in student experience – depending on whether they have prior employment within the organisation. Internships also serve as spaces for broader reflection. Students may use this period to assess whether the profession aligns with their personal and professional aspirations, often seeking roles that are dynamic, meaningful, and challenging (Seemiller & Grace, 2016). Recent findings suggest that motivation and identity development are not static during internships, but shift in response to feedback, autonomy, and contextual conditions (Bundgaard et al., 2023; Mykkänen, Kupila & Pekkarinen, 2022). These dynamics point to the need for more intentional and reflective design of practice-based learning environments within certain sectors.

This paper contributes to the thematic area of practice-oriented Reflective Practice-based Learning, with a particular focus on internships and the theory-practice interplay. Through an empirical study of finance students' experiences during their internship, we seek to explore how reflective and motivational processes interact with professional, organisational, and regulatory conditions to shape the opportunities for transfer. The following research question is addressed:

How do students in the Bachelor of Financial Management and Servicesprogramme experience and deal with transfer during their internship?

Theoretical background

One of the central challenges in professional education, particularly within fields that combine analytical knowledge with professional judgement such as financial education (Lyons & Neelakantan, 2008), is students' ability to translate theoretical knowledge into practice (Wahlgren & Aarkrog, 2012). While it is often assumed that students will naturally apply what they have learned once they enter the workplace, research consistently shows that transfer of learning does not occur automatically. Instead, it is a complex process, influenced by contextual, institutional, and individual factors (Wahlgren, 2009; Aarkrog, 2019).

Learning as a Process of Interaction

Understanding learning as an active and situated process is central to both transfer and RPL. Illeris defines learning as a transformative process involving the interaction between individual and context. Illeris elaborates this through his learning triangle, consisting of three dimensions: content, incentive (driving force), and interaction, all embedded in a societal context (Illeris, 2009a).

In the context of financial education, the content dimension typically focuses on economic models, legal frameworks, and quantitative analysis. However, technical knowledge alone is insufficient for success in professional roles that require discretion, ethical judgement, and social awareness. The driving force and students' motivation and engagement is especially relevant for Generation Z. Seemiller and Grace (2016) characterize this generation as seeking structured and purpose-driven learning experiences that align with their personal values. Twenge (2017) further adds that Generation Z students prefer dynamic, fast-paced environments that offer immediate relevance and personal growth opportunities. The interaction dimension reflects how learning is shaped through collaboration, dialogue, and social practice, both within education and in professional settings. This understanding relates to constructivist learning theory (Bruner, 1999) and situated learning (Lave & Wenger, 1991), which highlights the importance of context, community, and participation in meaning-making processes. These perspectives support the RPL framework by emphasising that meaningful learning involves active participation in real-world practices, not just theoretical understanding.

Transfer: Bridging Learning Contexts

The connection between educational knowledge and workplace practice lies at the heart of RPL. Transfer refers to the learner's ability to apply what has been learned in one context to another, typically from the classroom to the internship or professional setting (Wahlgren & Aarkrog, 2012; Perkins & Salomon, 1992). But transfer is rarely guaranteed (Aarkrog, 2019). Its success is shaped by multiple factors; individual learner characteristics, the design of teaching and learning activities, and the conditions of the workplace (Facteau et al., 1995; Wahlgren & Aarkrog, 2012). Illeris (2009a) draws attention to the barriers between different learning spaces. In this context formal (educational), informal (workplace), non-formal, self-directed, and digital, and how these barriers may hinder transfer. In the financial sector, these challenges are intensified by regulatory restrictions, which can prevent students from engaging fully in tasks aligned with their theoretical training. As a result, even highly capable students may find themselves excluded from critical learning opportunities. A further distinction is made between proximal and distal transfer. Proximal transfer (Thorndike & Woodworth, 1901) occurs when learning is applied in contexts like those in which it was acquired, whereas distal transfer (Judd, 1908) involves the application of knowledge in significantly different contexts. The latter demands higher levels of reflection, flexibility, and adaptive thinking, all of which are key components of RPL and especially relevant in internship settings.

Motivation, Supervision, and Psychological Safety

Motivation and a supportive learning environment are essential for facilitating transfer. Research highlights how supervision quality, constructive feedback, and psychological safety strongly influence students' willingness and ability to engage actively in practice engagement (Facteau et al., 1995; Kontoghiorghes, 1998, 2001; Edmondson, 1999). These factors are particularly critical in internships, where learners must navigate unfamiliar environments and evolving expectations. When students feel safe and respected, they are more likely to take risks, ask questions, and reflect on their own development. Motivation also affects how students engage with their internship. Popov (2024) distinguishes between two motivational orientations: one focused on understanding the professional role and context, and another aimed at preparing for full-time employment by learning how to act as a novice professional. Both ori-

entations play a role in shaping the student's approach to reflection and transfer. Furthermore, the ability to set clear learning goals and prioritise relevant competencies supports transfer (Wahlgren & Aarkrog, 2012). This intentionality allows students to navigate the complexity of the workplace while aligning their educational experiences with future professional demands.

Reflection and Transformative Learning

In the context of RPL, reflection is often seen as the central mechanism for bridging theory and practice (Schön, 1983). The concepts of reflection-in-action and reflection-on-action remain foundational for understanding how professionals learn through experience. However, reflection is not always rational or straightforward. Jarvis, as cited in Wahlgren (2010), points out that emotional stress or lack of confidence (which is common during internships) can inhibit reflection and thus hinder learning. To move beyond surface-level application of knowledge, transformative learning theory offers a deeper lens. Mezirow (2002) describes transformative learning as a process where individuals reflect critically on assumptions and values, leading to new ways of thinking and acting. Wahlgren (2010) notes that such deep reflection is often underprioritised in internships, which tend to focus on task completion rather than professional identity formation. Yet, identity is a key outcome of RPL. As Wahlgren & Aarkrog (2012) emphasise, students' sense of pride and ownership of their professional role significantly shapes how and whether learning is transferred and sustained.

Learning Characteristics of Generation Z

As young learners navigating the transition between education and professional practice, they bring with them distinct generational characteristics that influence how they engage with learning and supervision. Research indicates that Generation Z (people/students born approximately 1996–2012) is particularly motivated by learning environments that offer clear structure, meaningful purpose, and opportunities for personal and professional development (Seemiller & Grace, 2016; Twenge, 2017). They tend to prefer ongoing feedback, explicit goals, and practical tasks that are perceived as relevant to their own identity and future careers (FranklinCovey, 2023).

These preferences have implications for how learning and transfer occurs during internships. For learning to be effectively transferred into new and often ambiguous contexts, students need to perceive a sense of coherence and relevance between their academic knowledge and the tasks they are assigned. When tasks lack progression, clarity, or space for reflection, students may become disengaged or uncertain about their role. In contrast, when learning environments support active participation, encourage dialogue, and offer structured feedback, students are more likely to reflect, adapt, and apply their knowledge in meaningful ways (Boud & Solomon, 2001; Stillman & Stillman, 2017). Additionally, research highlights the potential for generational gaps between students and supervisors. Many internship mentors belong to Generation X or Y, a cohort associated with more autonomous and experiential learning preferences and less reliance on explicit instructional support (Costanza et al., 2012; Lyons & Kuron, 2014). This generational difference can lead to mismatched expectations in supervision, potentially influencing how feedback is given, how learning is scaffolded, and how reflection is encouraged.

Overall this study is guided by Illeris' learning dimensions (including the driving force dimension), Mezirow's transformative learning theory, and Wahlgren's perspectives on transfer conditions as the overall theoretical framing. In the analysis, these are complemented and operationalised through concepts such as Schön's reflections, Thorndike & Judd's transfer types, and Edmondson's psychological safety, which are applied more directly as analytical tools for interpreting the students' experiences.

Method and data

This study employs a qualitative case study design, as defined by Yin (2018), who emphasizes case studies as suitable for exploring complex phenomena in real-life contexts, especially when the boundaries between phenomenon and context are blurred. To this the study adopts an explorative and inductive research design, aiming to remain open to the participants lived experiences and to allow flexibility in refining the research focus as new insights emerged. To explore how finance students experience transfer during their internships, eight qualitative focus group interviews were conducted with students. In total 12 students participated. Focus groups were selected as the data collection method

due to their ability to foster collective reflection, encourage diverse perspectives, and illuminate complex social and professional learning phenomena (Halkier, 2016). The social interaction between participants was expected to generate nuanced insights, as students built on each other's contributions and made sense of their experiences together. Each group consisted of two to five participants, allowing for rich yet manageable discussions. The students were all in their fifth semester and engaged in their mandatory internship. Participants were selected by the researchers who had previously taught and supervised them. While this helped ensure engagement and trust, it may also introduce selection bias, as the researchers selected students they perceived as academically strong and willing to participate. This potential limitation was considered in the analysis, where emphasis was placed on allowing students' voices to shape the findings. Thus, while the sample is not representative of the broader student population, it supports the phenomenological aim of the study. The interviews were conducted in three phases during the fall of 2024 to capture the development of students' experiences over time:

- Phase 1: Three interviews, end of August (beginning of internship)
- Phase 2: Three interviews, mid-October to early November (midway)
- Phase 3: Two interviews, December (near the end of internship)

Separate interview guides were prepared for each round, focusing on learning, transfer, and reflection. The guides were developed in an iterative process, where preliminary themes from earlier rounds informed the questions in subsequent interviews. This approach supported a gradual deepening of understanding and allowed the researchers to remain responsive to emerging insights. All interviews were conducted via Microsoft Teams, recorded, and fully transcribed without alteration. Data analysis was carried out using meaning condensation, where transcripts were read holistically to identify themes across the interviews (Kvale & Brinkmann, 2015). These meaning units were coded manually and clustered into thematic categories through a stepwise interpretive process. Themes were discussed and refined collaboratively between the researchers to ensure internal consistency and a structured analysis. Throughout the research process, ethical considerations were taken seriously. Participation was voluntary, and all students gave informed consent. In recognition of the dual role of the researchers as former instructors and inter-

viewers, efforts were made to maintain reflexivity during data collection and analysis. This included conscious attention to participants' interpretations and collaborative discussion to minimise interpretive bias.

The case context: The FIBA Programme and the Internship Structure

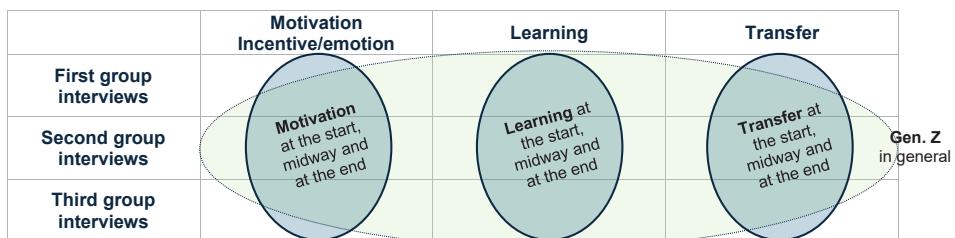
FIBA is a 3.5-year professional bachelor's programme. It prepares students for jobs in banking, insurance, auditing, real estate, property management, and financial departments in public and private organisations. The education includes only one internship period. The internship spans five months, from mid-August to the end of December, and is equivalent to a full-time 37-hour work week. It awards 30 ECTS credits and is treated as a professional placement comparable to regular employment. Students are responsible for securing their own internship placements across the various sectors. This decentralised and student-led placement process may generate substantial variation in learning outcomes and access to professional learning opportunities. Internship tasks vary widely depending on sector, company, and regulatory conditions. In highly regulated areas – such as investment advising – students often participate primarily through observation, as compliance requirements restrict direct involvement. Conversely, in industries such as banking, auditing, and property management, companies increasingly offer part-time jobs to students earlier in their studies, allowing for a more gradual and integrated professional socialisation. During internships each student is assigned two supervisors: one from the internship company and one from the educational institution. The academic supervisor supports the development of the final project report, which constitutes the basis for examination. From the perspective of RPL, this structural setup both enables and constrains students' learning. While the internship can offer a rich arena for integrating experience, thinking and action, success depends on factors such as meaningful engagement, psychological safety, and opportunities for reflection and feedback. These elements are particularly relevant for Generation Z students, who are often characterised by a strong desire for purpose, autonomy, and continuous support (Seemiller & Grace, 2016; Turner, 2015; Twenge, 2017). Some students thrive in navigating these demands independently, while others struggle in the absence of institutional guidance or clear learning goals.

This case study thus serves as a lens through which to examine how a single, high-intensity internship within a financially oriented professional bachelor's programme facilitates – or hinders – the transfer of academic knowledge into professional practice.

Analysis and findings

The approach in the analysis is grounded in the theoretical framework presented, with particular focus on themes such as transfer, learning and motivation. The aim is to uncover how students experience and navigate the different phases of their internship – from its beginning, during, and up to its conclusion. The structure for the analysis follows these elements:

Table 1: Structure of analysis (made by authors)



Part 1: The journey of incentive during internship

In the context of learning both motivation, emotion and volition play a significant role. According to Illeris (2006), it is often uncertainty, curiosity, or a sense of need that drives individuals to pursue new knowledge, understanding, or skills. The students in this study described themselves as highly motivated at the start of their studies, although some noted that this motivation declined as their programme progressed. A few students highlighted specific courses or teaching styles as sources of renewed motivation during their academic studies. Motivation was especially high as students entered the internship, and several emphasised the benefits of having a student job in the company prior to the official internship period. This early exposure provided familiarity with internal systems, work routines, and organisational culture.

As one student shared: “What really appealed to me about the bank versus all the others was that they offered student jobs a year ahead of the internships.” (Student, first group interview, A 12:55).

Another added: “It’s really nice to get a student job. Because when you start the internship, you already know the whole system and many of the things that you needed to use the first few months of the internship to learn. So it might help you get off to a better start in the internship.” (Student, first group interview, A 14:30).

These statements reflect a strong drive among students to feel prepared for their internship. The desire to “hit the ground running” suggests an underlying aspiration to engage meaningfully with professional tasks rather than spending valuable time on onboarding or learning basic administrative systems. However, this early familiarity also presented challenges for some. Students who had already spent time in the organisation prior to the internship described a lack of novelty, and in some cases, felt that their assigned tasks were too simple or repetitive. This shift – from initial excitement to a desire for professional growth – can be understood as part of a process of reflective professionalisation, where motivation evolves from external stimuli to internalised aspirations for competence and belonging. This development reflects Illeris’ driving force dimension, where motivation shifts from external aims (e.g., job security) to internalised professional aspirations. Popov’s two orientations – exploring the role versus preparing for employment – are also evident, showing how students’ motivation evolves in the process. This dynamic illustrates how motivation is not static but transforms in response to learning opportunities, feedback, and organisational expectations. Over time, students generally reported increased confidence and comfort in their internship roles. They learn how to approach tasks more efficiently and gained clarity on whom to consult for support. According to Illeris (2006), this growing familiarity contributes to a sense of competence and strengthens students’ emotional foundation for learning. Students also emphasised that personal relationships in the workplace enhanced their motivation and sense of inclusion. These connections often opened doors to new and more complex assignments, underlining the importance of social belonging in the learning process. This finding resonates with Facteau et al. (1995), who argue that a motivating and supportive work environment enhances the learner’s ability and desire to apply newly acquired knowledge. Yet, the students also encountered

limitations. Most notably in terms of task access which in turn affected their perceived opportunities for development. The analysis reveals that compliance restrictions and limited task access can act as systemic barriers to transfer. Even when students are motivated and theoretically well-prepared, the absence of real participation opportunities reduces the likelihood of meaningful knowledge application. This finding underscores Wahlgren & Aarkrog's (2012) point that transfer requires favorable contextual and organisational conditions and not just capable learners. The potential for post-internship employment also played a motivating role. Several students described how the prospect of being hired after the internship encouraged them to perform well and demonstrate initiative: "I'm still very motivated to show up, be here and do well. Because I know that no matter if I choose to continue here, they are my boss now and they are also the ones who are going to hire me." (Student, second group interview, A 02:38). Others saw the internship as a space for career clarification: "I also have a great motivation to have learned a lot of things during the process in terms of being able to have calm about whether I want this or not. I want to have experienced as many aspects of it as possible." (Student, third group interview, B 09:38).

As Illeris (2006) notes, uncertainty – both about what needs to be learned and whether one is capable – can challenge motivation. The students in this study described how compliments, feedback, and increased responsibility during the internship helped build their self-confidence. This finding supports the importance of emotional support and recognition in sustaining motivation and learning. In summary, students expressed strong motivation throughout their studies, particularly in relation to the internship. The feeling of making progress, gaining trust, and receiving increased responsibility contributed significantly to their motivational state (Edmondson 2020). These conditions are essential for reflective and transformative learning processes and serve as important enablers for successful transfer.

Part 2: Do I learn anything?

The desire to develop and continuously learn is fundamental to most learners (Maslow, 1976), but such development often depends on whether the individual feels motivated to engage with new content. As one student expressed: "But I think my learning is related to whether I'm motivated.

So if I'm not motivated to learn it, then I disconnect." (Student, first group interview, C 21:49). This quote highlights a core principle of learning theory: that meaningful learning begins with inner motivation. Illeris (2006) also emphasises that learning involves more than cognitive acquisition; it is deeply shaped by the learner's emotional and motivational state. Students in this study often associated learning with novelty and variation. Routine tasks and repetitive activities were described as "boring", while the opportunity to try something new was perceived as engaging and challenging. The findings corresponds with characteristics often attributed to Generation Z learners, who are driven by purpose, challenge, and relevance (Hora, 2017; Seemiller & Grace, 2016).

"It's very new. There's a lot more to it when you're out on the job. It's like this and this and this in the real world.... but it's great to come and try new things." (Student, first group interview, A 35:43). This student's excitement illustrates the "driving force" in Illeris' learning triangle, reinforcing how emotional engagement supports the acquisition of new knowledge. It also echoes Dewey's (1916/2007; 1897) principle of *learning by doing* – the notion that hands-on experience fosters deeper understanding. Many students also highlighted how their internship sites acknowledged their status as learners, offering space to explore, make mistakes, and ask questions. This aligns with Dewey's view that learning requires experimentation – and that failure is not a weakness but a necessary part of the learning process. Psychological safety, as conceptualised by Edmondson (2020), becomes vital in such contexts. Learners must feel safe enough to try, fail, and reflect without fear of negative consequences: "In terms of mistakes, I was told, from day one you're going to make 1.000 mistakes and that's the way you learn." (Student, second group interview, C 08:54). This quote illustrates the presence of a psychologically safe learning environment, where the student are encouraged to explore and where error is framed as part of growth. This also supports Illeris' (2006) content dimension, as failing does not only develop skills but promotes understanding of the content and its context. Students described learning both professional knowledge – such as models, concepts, and calculations – and broader competencies, including communication, interpersonal understanding, and analytical thinking. These "soft skills" were particularly developed through interaction with colleagues and clients, and through proactive involvement in real-world activities: "... I'm always looking for new challenges. After all, I've had

this student job before, but I constantly catch myself asking the others if there are any new things or anything else I can participate in. Both assignments and meetings. I have a lot of room to explore, so to speak, and if it's something I want to do, all I have to do is ask. And 9 times out of 10 I'm allowed to do it." (Student, first group interview, B 17:50).

This statement highlights the student's drive in shaping their learning path, which aligns with Illeris' interaction dimension (Illeris 2006). The student's active inquiry and the organisation's positive response suggest a culture that fosters engagement and growth – characteristics that enable tacit knowledge to become explicit through reflection and interaction. To support learning during the internship, students and their internship providers are required to complete a written internship plan. This plan outlines the expected learning activities and assignments and is approved by an academic supervisor. While students did not always follow the plan strictly, they often referred to it as a helpful reference point. As one student noted: "It (the internship plan) is a net (security net), if I start to feel that I fall out and do not develop. Then we can use it to talk about, and aligning the internship compared to my expectations." (Student, first group interview, B 40:13). This illustrates that reflection is often situational and supported by documentation, routines, and dialogue. Moreover, the student's desire to influence their own learning connects to generational preferences for autonomy and personalised development (Seemiller & Grace, 2016; Twenge, 2017). This highlights the importance of learning cultures that support co-constructed experiences.

Part 3: Transfer and how to apply learning in another context

The data indicates that transfer does not occur automatically. Rather, the process is influenced by a complex interplay of recognition, reflection, contextual support, the learner's personal development and career reconsideration. Several students reported recognising and applying theoretical concepts from their education during their internship. One student recalled how a case-based role-play exercise was mirrored in real client interactions: "There were many of the things we learned during that course that I've used when sitting in the chair across from the customer" (Student, third group interview, B 12:09). This is an example of proximal transfer (Thorndike & Woodworth, 1901), where the learning context closely resembles real-life (Horn, Pedersen, Georgsen, 2021). Other students described how prior knowledge only began to make sense once

it was re-encountered in a practical setting, sometimes long after the initial learning had taken place. In such cases, the transfer could be characterised as distal transfer (Judd, 1908), which requires more reflection and abstraction. Another layer to the transfer process concerns the role of practical reasoning and judgment. As one student remarked; “common sense can get you far” (Student, third group interview, C 09:27), indicating that the application of knowledge is not merely technical or mechanical. Instead, it involves interpreting, adapting, and integrating knowledge in response to specific contextual demands. This aligns with Wahlgren & Aarkrog’s (2012) understanding of transfer as an active and situated process shaped by reflection and adaptation. Reflection plays a critical role in making transfer meaningful. Students demonstrated both reflection-in-action and reflection-on-action, as conceptualised by Schön (1983). Some described becoming aware of theoretical applications in the moment, while others realised it later: “Now I can better and better see how it fits into the real context [...] Now I can better see the meaning of it all.” (Student, third group interview, C 13:14).

This illustrates how understanding is often constructed retrospectively, through experience. Reflection, in this sense, is not merely about knowledge but also about personal growth. According to Mezirow (Mezirow 1994; Wahlgren, 2010), reflection may lead to transformative learning, in which students shift their perspectives and develop a renewed understanding of themselves as professionals. However, such reflection requires time. Several students noted that a fast-paced work environment sometimes limited their ability to pause and process what they were learning. One student expressed a desire for more time to capture the experiences: “I wish I could spend a bit more time just absorbing some of the learning.” (Student, third group interview, C 40:57). This supports Jarvis’s argument (as cited in Wahlgren, 2010) that reflection requires not only cognitive effort but also emotional security and organisational support. It underlines the importance of creating intentional spaces for reflection before, during, and after the internship. This is in line with Illeris’ (2009b) perspectives, and the importance of incorporating different learning activities that can lead to different types of learning. Transfer is further shaped by the supportiveness of the work environment. Several students emphasised the crucial role of mentors and colleagues in building their confidence to apply and develop their professional knowledge. As one student described: “My manager involves the other

colleagues in my development and makes sure I continue to build on it (own development)." (Student, third group interview, C 44:14). These experiences point to the importance of psychological safety (Edmondson, 2020) in fostering transfer. A workplace culture that encourages questions, feedback, and proactivity enables students to test, reflect, and refine their knowledge in practice. Confidence emerged as a key factor in the transfer process.

Several students described a transformation in their self-perception during the internship (Mezirow, 1991), and how they moved from uncertainty to greater autonomy. One student explains this progression: "When you start out, you're maybe a bit afraid to answer the phone [...] whereas now it's like: Your advisor is in a meeting, but how can I help you?" (Student, third group interview, C 25:02). This narrative illustrates how self-efficacy and confidence are both outcomes of and prerequisites for transfer. As students become more comfortable in their roles and are treated as competent by their colleagues, they are more likely to apply their knowledge. Hereby more likely to develop a professional identity. Mezirow's framework (1991; 1994) supports this view, highlighting that learning involves personal transformation as much as the acquisition of knowledge. While most students spoke positively about their internship, the experience also led some to reconsider their career choices. In some cases, this was due to a perceived lack of challenge or a misalignment between their personal values and the realities of the profession: "I honestly think it's a waste of hard work on an education [...] and then you just don't get challenged enough." (Student, third group interview, C 34:43). Another student: "I love this place, but I honestly don't know if it's the right industry for me [...] I find it very restricted to be somewhere from 8 to 4." (Student, third group interview, C 29:09). These reflections suggest that transfer is not only about applying knowledge. This also involves identity formation and professional clarification (Mezirow, 1994). When theory and practice fail to align meaningfully, students may feel a reduced sense of motivation or professional belonging (Seemiller & Grace, 2016). While Wahlgren & Aarkrog (2012) describe these as transfer barriers, Mezirow's perspective suggests this also can be seen as evidence of transformative reflection where experience leads to new insights about one's values, direction, and professional goals (Mezirow, 1991; Wahlgren, 2010).

The findings illustrate that motivation, learning, and transfer are deeply interconnected. Motivation, enhanced by recognition, meaningful tasks (Illeris, 2009a), and career prospects, serves as the driving force for engagement and reflection. Learning, in turn, emerges as both cognitive and transformative, shaped by reflection-in-action and -on-action (Schön, 1983) and supported by psychologically safe environments (Edmondson, 1999). These conditions enable students to move from proximal to distal transfer, applying theoretical knowledge in increasingly complex and unfamiliar contexts (Thorndike, 1901; Judd, 1908). When motivation, reflective practice, and supportive conditions align, transfer becomes not only a technical skill but a developmental process that strengthens professional identity and clarifies career aspirations (Mezirow, 1991; Wahlgren, 2010).

Conclusion

This study aimed to understand how students in finance education experience and navigate transfer during internships. The findings indicate that internships offer significant potential for reflective and practice-based learning, particularly when students are able to actively connect theoretical knowledge to the professional practice. The findings provide insight into how transfer, learning and motivation interact within specific organisational and regulatory context. According to the data, students appeared highly motivated to engage with their internships, especially when they had prior experience with the company through student jobs. These students often entered with strong expectations for development, but some encountered a lack of progression in their tasks. This points to the importance of sustained challenge and novelty in maintaining motivation and supporting reflective development during the internship period. This finding underscores the importance of early onboarding as a strategy for accelerating access to tasks and fostering ownership.

However, motivation was not static. As the internship progressed, it evolved from initial enthusiasm to a deeper engagement with professional identity, confirming that motivation itself can be transformative when supported by trust, responsibility, and feedback. One of the findings is the situated and often unstructured nature of reflection. Students experienced powerful learning moments in practice, but rarely within planned or scaffolded activities. Transfer emerged not as a straightfor-

ward process but as a dynamic interplay between context, confidence, and cognitive-emotional readiness. Students who felt psychologically safe and seen by their colleagues were more likely to try more complex assignments and bridging the gap between theory and practice. This reinforces the role of psychological safety as a condition for transfer, and the importance of a culture where mistakes are framed as learning opportunities. Another insight from the analysis is the identity-forming function of transfer. The ability to apply knowledge meaningfully was linked to students' sense of belonging and self-understanding. In some cases, the internship clarified that the profession was not a good fit. Finally, the findings suggest that RPL in a very complex sector like finance must account for the structural limitations students face, with barriers that can limit access to specific tasks, which in turn may hinder both learning and identity formation.

In conclusion, a successful internship requires more than a relevant placement. It also depends on an active learning orientation from the student and a learning environment characterised by openness, support, and structured opportunities for reflection. For RPL to thrive in the financial sector – and other regulated or commercially structured fields – educational institutions and internship providers must collaborate to ensure that learning is transparent, scaffolded, and support psychologically safety. These insights may inform the future design of practice-oriented education, where reflective learning is not left to chance, but cultivated through intentional pedagogical and organisational efforts.

Future research and limitations

This study suggests several directions for future research. First, a broader sample could provide more nuanced insights and reduce potential selection bias. This might include a larger group of students from The FIBA program as well as participants from related programmes. Comparing experiences across programmes could help clarify which learning conditions and organisational contexts most effectively support reflective practice-based learning and transfer. Second, future research could more explicitly examine the impact of prior student employment on internship experiences. Findings from this study indicate that students with such backgrounds often enter the internship with elevated expectations for personal and professional growth. While this can facilitate early task

access and confidence, it may also lead to disappointment when learning opportunities do not meet these expectations. In some cases, students even reconsidered their career ambitions, suggesting that pre-existing organisational familiarity may shape not only motivation but also identity development. A key limitation of this study is that it includes only student perspectives. The analysis could be further strengthened by incorporating data from internship supervisors or organisational representatives. Their insights into how companies structure learning, manage expectations, and support reflection and transfer could help contextualise the student experience and clarify the organisational dimension of RPL. Given the diversity of industries involved, it is likely that practices vary significantly across contexts. Finally, as all participants belong to Generation Z, future studies could explore how generational characteristics shape internship engagement. It would also be valuable to investigate whether and how internship providers adapt their approaches in response to these generational preferences.

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Work-integrated Reflective Learning and Business Outcomes Among College Graduates

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Abstract

Entrepreneurship is a key driver of economic development, and higher education plays a pivotal role in nurturing entrepreneurial potential. Multiple studies have examined the relationship between students' entrepreneurial intentions and various individual and entrepreneurship support factors. However, relatively little attention has been paid to the role of work-integrated reflective learning in entrepreneurship and its relationship with other support factors, particularly in relation to the longevity of the entrepreneurial activities of the business programme's graduates. The aim of this research is to investigate which educational factors related to work-integrated reflective learning along with individual factors of students predict the sustainability of entrepreneurship one year after graduation among alumni of the short-cycle professional higher education program in Micro, Small, and Medium Enterprise Management at the College of Business Administration (CBA) in Latvia. Survey data were collected from 67 graduates who completed the programme between 2019 and 2023. The data were analyzed using logistic regression analysis. The results show that two factors – entrepreneurial experience prior to studies and the perceived usefulness of business development skills acquired through work-integrated learning – significantly increased the likelihood of graduates maintaining an active business one year after graduation. Among the two, previous entrepreneurial experience emerged as the strongest predictor. The results provide important insight into how to support new entrepreneurs effectively during the initial years of their ventures. The findings may be useful for educational

institutions in improving professional higher education programmes in entrepreneurship, especially in the design of internship programmes.

Keywords

Work-Integrated Learning, Reflective learning, Entrepreneurship development, Mentoring, Internship program, Professional higher education.

Introduction

The job market is changing fast due to the shift to a green and digital economy and the rise of new technologies. These changes are putting pressure on each country's competitiveness, growth, and sustainability goals. Therefore, entrepreneurship education has become an increasingly important component in promoting economic growth and innovation on a global scale. It aims to equip individuals with the knowledge to create and develop businesses within a dynamic market environment and provides fundamental foundations for understanding the business environment, acquiring market research skills, and identifying new market opportunities. As a result, young entrepreneurs can more effectively develop business ideas and execute them based on sound strategies.

The European Commission has been instrumental in promoting entrepreneurship education. In 2016, it introduced the European Entrepreneurship Competence Framework (EntreComp) to enhance the entrepreneurial capacities of European citizens and organizations (The European Commission, 2016). The framework creates a shared understanding of the knowledge, skills, and attitudes needed to become an entrepreneur. The role of education, particularly short-cycle professional higher education, is to develop these skills in students. EntreComp provides a valuable reference point for structuring work-integrated learning (WIL) and mentorship as practical and personalized approaches to building entrepreneurial competence. Through real-world learning experiences and guidance from experienced mentors, students can actively apply and strengthen the competences defined by EntreComp, such as creativity, taking initiative, working with others, and managing uncertainty. These approaches bridge the gap between theory and practice and are essential for embedding entrepreneurial thinking in education.

This article explores the role of entrepreneurship education and, more specifically, work-based learning supported by mentorship in the entre-

preneurial success of former students. Using theoretical perspectives and empirical findings, this study aims to explain how entrepreneurship education promotes business development, resulting in broader economic and social growth.

Work Integrated Learning and Its Approach in the Entrepreneurship Education

Work-Integrated Learning (WIL) continues to gain importance in higher education, linking academic curricula with real-world application. Experiential learning is increasingly acknowledged as the preferred approach in entrepreneurship education, emphasizing students' engagement with real-world experiences (Eisenstein et.al., 2021). WIL is defined as a pedagogy that "purposefully places students in a real or simulated working environment, as part of the students' academic activities" and that has a "focus on a real-world, well-defined working environment for them to interact with and to reflect upon" (Eisenstein et.al., 2021, p. 414). WIL equips students with practical skills and real-life knowledge, thus addressing gaps between theoretical learning and the dynamic demands of business workplaces. WIL is founded on closely integrating university studies with workplace practice to facilitate the application of academic knowledge in professional settings (Smith & Worsfold, 2015). It allows students to engage with their future work environments while developing generic professional skills that enhance their employability (Patrick et al., 2008). However, integrating WIL into academic curricula presents significant challenges, particularly in aligning assessments with the varied requirements of external workplace environments.

WIL plays a transformative role in enhancing graduate employability in future workplaces. Employability encompasses a diverse set of skills and abilities. Smith and Worsfold (2015) argue that work-ready students possess a variety of skills and abilities that make them immediately employable. Consequently, WIL has the potential to develop entrepreneurship in students already aspiring to become entrepreneurs while also inspiring entrepreneurial thinking in those who may not have previously considered this career path (Pretti et al., 2020). Programs like supervised entrepreneurial WIL (sEWIL) allow students to experience dynamic, early-stage start-up environments, providing a rich context for learning entrepreneurial skills while contributing directly to business outcomes

(Eisenstein et al., 2021). This context sets WIL pedagogy apart from most other experiential learning approaches.

Young generations have especially benefited from structured programs, such as internships as part of entrepreneurial training. Such programs improve technical competencies and foster creative thinking, resilience and adaptability. Febrianti et al. (2023) highlight the efficacy of internships in helping students transition from academia to professional environments by fostering a deeper entrepreneurial mindset. Furthermore, Winborg and Hägg (2023) demonstrate how corporate development projects prepare students for corporate entrepreneurial roles. Under a corporate development project, students take ownership of both the project and the learning process. Consequently, students must be given the opportunity to influence the project's scope, methods, and outcomes.

Implementing WIL faces numerous challenges, including aligning expectations from all parties and ensuring program efficiency. Ajjawi et al. (2020) emphasize the frequent misalignment between workplace tasks and duties and academic assessments, which can diminish the value of the learning experience. C-19 pandemic has further exposed these challenges, necessitating innovative solutions such as virtual WIL experiences. However, these solutions often fail to replicate the interpersonal and social dynamics of in-person placements, crucial for soft skill development (Pretti et al., 2020).

Assessment practices in WIL have evolved over the last years to better reflect the development and requirements of a contemporary working environment. Ajjawi et al. (2020) propose authentic assessments that align closely with workplace scenarios, thereby increasing the relevance and applicability of academic evaluations. Tools like reflective journals and self-assessment frameworks encourage students to critically analyze their learning journeys, resulting in deeper professional growth (Eisenstein et al., 2021). Ajjawi et al. (2020) promote an innovative approach that sees assessment not just as a tool for evaluation but as a synthesis of theoretical knowledge and practical application. By fostering engagement between students, academic institutions, and industry professionals, educational programs can enhance the effectiveness and efficiency of WIL assessments.

Moreover, projects like entrepreneurial co-ops, where students work on their own start-ups, strengthen experiential learning. These assessments focus on real-world outcomes such as product-market fit and

business scalability, ensuring students gain practical entrepreneurial skills (Mian et.al., 2016). However, there are also drawbacks. While established companies operate in clearly defined physical spaces, new ventures are often launched in informal settings, such as homes or coffee shops (Eisenstein et al., 2021).

Additionally, supervised WIL programs, such as those described by Eisenstein et al. (2021), involve placing students within early-stage ventures under the guidance of experienced entrepreneurs. This enriches their understanding of start-up dynamics and builds critical skills in leadership and innovation. By participating in supervised placements with early-stage startups, a pedagogy known as supervised-EWIL, students gain experiential learning in a genuine entrepreneurial environment, achieving the learning objectives of learning through entrepreneurship (Eisenstein et al., 2021).

Research on learning and knowledge transfer highlights that individuals acting as brokers and intermediaries, such as mentors in incubators, play a vital role in fostering organizational learning (Assenova, 2020). When viewed through the lens of Kolb's (1984) experiential learning cycle, WIL provides concrete experience and active experimentation, while mentorship supports reflective observation and abstract conceptualization. Through this interplay, mentoring enables students to process workplace experiences more effectively, make informed entrepreneurial decisions, and develop self-efficacy. Mentorship is highly important in WIL programs, significantly enhancing the success and performance outcomes. Nabi et al. (2019) highlight the diverse role of mentors in entrepreneurship education, ranging from technical guidance to emotional support during critical decision-making periods. Assenova (2020) demonstrates how high-ability mentors improve revenue and profitability outcomes for mentees, especially in resource-constrained settings. Mentoring can assist entrepreneurs in applying new knowledge about operations and scaling for their ventures, enabling them to drive change and enhance business performance.

Reflective learning as crucial component of WIL

Reflection is a very important part of learning from experience. It is broadly defined as the process of consciously examining and analyzing events or experiences to draw lessons and add meaning to them (He-

lyer, 2015). By analyzing concrete events, individuals can understand the reasons behind and what to change in the future, thus avoiding repeating mistakes (Helyer, 2015). Reflective practice can be significantly enhanced through peer support or structured mentoring, where experienced students mentor less experienced students or workplace mentors provide guidance in a safe and open environment (Helyer, 2015).

In WIL, reflection acts as the bridge that transforms pure experience into meaningful learning, as emphasized by Kolb's (1984) experiential learning theory, which highlights reflective observation as the key stage where concrete experiences evolve into valuable educational insights.

Mentorship Role in Entrepreneurship Education

Mentorship can be helpful for young entrepreneurs willing to succeed in the business world. One of the most effective approaches involves pairing young entrepreneurs with experienced business professionals who provide strategic insights and practical advice to help them avoid costly mistakes (St-Jean, 2011).

A mentor is an individual with extensive expertise and knowledge in a particular field, including entrepreneurship (Memon et al., 2015). The cooperation between a young entrepreneur and an experienced entrepreneur is known as business mentoring. A mentor helps young entrepreneurs to develop their business by providing both professional advice and moral support (Diawati et al., 2023). Consequently, the role of mentorship in entrepreneurship education is becoming increasingly important.

Studies show that young entrepreneurs who receive mentor support gain significant benefits: improved cognitive learning, new skills and knowledge, business vision and recognition of opportunities (Ashan, 2017). In addition, students experience emotional learning (decrease of the feeling of loneliness, improvement of self-efficacy and self-awareness), next to establishing new contacts that can contribute to an increase in sales and profitability of the company (Bisk, 2002; Zvaigzne & Kotane, 2019; Wikholm et al. 2005).

Key Functions of Mentor

The mentor's functions have been analyzed in various studies (Pellegrini & Scandura, 2005; Scandura, 1992). They can be categorized into three

main groups: psychological support, career-related guidance and role modelling. Authors of the article have consolidated insights about mentor roles as described by St-Jean (2011) and Kubberød et al. (2018) in Table 1.

Table 1: Mentor's function groups

Function Group	Function	Description
Psychological functions	Reflector	Provides feedback on the business and personal development of the mentee.
	Reassurance	Helps the mentee to overcome difficulties, to relieve stress and to maintain perspective.
	Motivation	Encourages the mentee, helps to develop self-confidence and promotes perseverance.
	Confidant	A trusting relationship may develop into a friendship, offering emotional support.
Career-Related Functions	Integration	Promotes the mentee's integration into the business environment by facilitating connections with key contacts.
	Information support	Shares relevant information and helps to access resources.
	Confrontation	Challenges the mentee's ideas and beliefs to foster effective problem-solving.
	Guide	Enhances the mentee's awareness of problems and provides advice on solutions.
Role and model function	Model	Shares personal experiences to inspire the mentee and to provide valuable learning opportunities.

Note. Synthesized by authors based on: St-Jean (2011) and Kubberød et al. (2018).

Developing Effective Mentoring Programs in Entrepreneurship

To effectively develop mentoring programmes in higher education institutions, several key aspects should be considered, as highlighted in studies by Prastyaningtyas et al. (2023), Kubberød & Fosstenløkken (2018), and St-Jean (2011):

1. Relationship building between a mentor and a young entrepreneur – organizing regular meetings, promoting open communication and identifying the individual needs of young entrepreneurs.
2. Development of mentors' competencies – providing the mentors with sufficient knowledge and skills in entrepreneurship to effectively manage the mentoring process.
3. Implementation of a structured mentoring programme – educational institutions should ensure a clear and targeted mentoring system.
4. Involvement of mentors in business decision-making – helping young entrepreneurs to make strategically important decisions.
5. Recognition and evaluation of mentors – motivating and incentivizing mentors to continue to provide support to young entrepreneurs.

The role of mentorship in entrepreneurship education is becoming increasingly important, as it equips young entrepreneurs not only with practical knowledge but also contributes to emotional growth and professional development. Well-structured mentoring programs serve as a critical foundation for entrepreneurial success.

Role of Other Factors in Starting Successful Business During Studies

There are also additional factors that can influence business success, as documented in numerous scientific publications. For example, Turner (2015) highlights three key factors for business success: leveraging the owner's networks and utilizing the business as a platform for customer-to-customer interactions, overcoming initial challenges in business planning while adapting to ongoing changes, and establishing a distinct marketing position. Hodges et al. (2016) identifies five critical factors for the success of apparel-related entrepreneurs and small businesses: relationship-building, niche identification, resourcefulness, community engagement, and global awareness. Their findings suggest that entrepre-

neurship and small business education within apparel programs should emphasize developing students' entrepreneurial competencies in these areas. The influence of the university environment and the entrepreneurial-university ecosystem in shaping entrepreneurial attitudes and commitment is a well-researched topic. University support extends far beyond the academic activities, by providing specific support for businesses, including advisory services, capital investment provision and market entry support (Muscio, 2022).

In addition to external and institutional factors, individual-level factors – such as demographic characteristics, experiential background, and psychological traits may play a significant role in shaping students' entrepreneurial success. Demographic factors such as gender and age have been shown to influence entrepreneurial intentions and outcomes. Male students often report higher entrepreneurial intent, partly due to greater risk tolerance and self-confidence, while female students may be more influenced by mentoring and role models and face structural or perceived barriers (Wilson et al., 2007; Langowitz & Minniti, 2007). Sahinidis et al. (2021) found that age significantly influences entrepreneurial intention, with results showing an inverse relationship beyond the 26–34 age group. Furthermore, prior experience, whether through work, family business involvement, or past entrepreneurial projects, enhances practical skills, entrepreneurial self-efficacy, and opportunity recognition (Unger et al., 2011). These findings highlight the importance of experiential learning and tailored support in entrepreneurship education. As regards individual psychological factors, research shows that traits such as self-efficacy, internal locus of control, and proactive personality are positively associated with the intention to start and sustain a business (Rauch & Frese, 2007). These findings underline the importance of personal development and psychological preparedness in entrepreneurship education programs, particularly for students pursuing business ventures during their studies.

Based on the theoretical framework, the authors posed the following research question:

Which educational factors related to workplace-integrated reflective learning and individual factors of students predict business ownership one year after graduation among graduates of the CBA study

programme “Management of Micro, Small, and Medium-Sized Enterprises”?

Method

Sample

The study sample consisted of 67 graduates of the CBA short-cycle professional higher education programme “Management of Micro, Small and Medium-sized Enterprises” who graduated between 2019 and 2023. The 2019 graduates were the first cohort to experience a revised entrepreneurship internship model at CBA that emphasised workplace-integrated reflective learning and introduced a requirement for students to register and develop their own business as part of their practical training, thus marking a shift in the programme’s approach to entrepreneurship education. Graduates from 2024 were not included in the target group, as they had not yet reached the one-year post-graduation period required by the study design. No additional inclusion or exclusion criteria were applied. Thus, the target population of the study was 132 individuals all of whom were invited to participate. A total of 67 graduates responded, resulting in a response rate of approximately 51%.

The duration of their studies at the college was 2.5 years or 5 semesters. Throughout their studies students participated in an entrepreneurship internship, during which they were required to develop a business idea, officially registered an enterprise, and actively work on growing their enterprise. During the internship, each student was assigned a mentor and engaged in structured reflective activities, including creating and maintaining an internship diary, preparing and delivering internship presentations, and receiving feedback from both their mentor and peers.

Of the 67 participants, 55.2% were male (n = 37) and 44.8% were female (n = 30). The average age of respondents was 36.84 years (SD = 7.52). Graduation years of study participants were distributed as follows: 2019 – 14.9% (n = 10), 2020 – 23.9% (n = 16), 2021 – 19.4% (n = 13), 2022 – 26.9% (n = 18), 2023 – 14.9% (n = 10).

Data collection methods

To explore the predictors of active business ownership one year after graduation, a questionnaire was developed. It was based on a literature review and the study’s conceptual model, focusing on work-based inte-

grated reflective learning, other forms of support, and individual factors among graduates of the CBA short-cycle professional higher education programme “Management of Micro, Small, and Medium-sized Enterprises.” The questionnaire consisted of 31 questions grouped into four thematic sections: 1. General information, 2. Workplace-integrated reflective learning (WIL), 3. Other factors of support received, and 4. Business sustainability. 20 questions were used for quantitative data analysis due to their relevance to the research objective and question.

The dependent variable – active business ownership one year after graduating from CBA, was measured with a binary (yes/no) question whether the respondent was still actively pursuing economic activity with the business developed during his studies one year after graduating from college. The independent variables are presented in Table 2.

Table 2: Overview of independent variables used in the study

Factor group	Variable	Example item / Description	Scale
Educational factors	Perceived usefulness of WIL-acquired skills for business development	<i>To what extent did the skills acquired in Entrepreneurship Internship help you in developing your business?</i>	Likert (1-5)
	Perceived mentor roles: Reflector, Persuader, Motivator, Confidant, Integrator, Informational supporter, Confronter, Guide, Role model	Sample: <i>The mentor provided feedback on my business</i>	Likert (1-5)
	Perceived usefulness of reflection activities	Select 1-3 most helpful types of reflection: report writing, diary entries, preparation of presentation, presenting, receiving feedback from mentor and from fellow students	Yes/No per item

Factor group	Variable	Example item / Description	Scale
Educational factors	Other Support Factors	Networking	Used networking opportunities during studies
		Participation in contests and support programs	Participated in entrepreneurship-related initiatives
		External funding	Received additional business funding (e.g., grants, awards)
		Guest lectures/workshops	Attended entrepreneurship-related events
		Peer support	Used support from fellow students
Individual factors	Prior entrepreneurial experience	Had business experience before starting CBA studies	Yes/No
	Age	Self-reported age (in years)	Continuous
	Gender	Self-reported gender	Male/Female/Other

Independent variables depicted in Table 2 were selected based on the conceptual framework and previous research, and they served as inputs in the subsequent correlation and regression analyses.

Procedure and data analysis

The survey was conducted in March 2025. The questionnaire was distributed via the platform Google Forms. A pilot test of questionnaire was conducted with a focus group of four students from various CBA graduation years and with differing levels of academic performance. After completing the survey, focus group participants took part in a reflection session on the Zoom platform, where they provided feedback on

the survey's length, clarity of questions, visual design, and suggestions for improvement.

After the refinement of the questionnaire, a survey link was distributed via email to all graduates of the CBA study programme Management of Micro, Small, and Medium-Sized Enterprises from the years 2019 to 2023 – a total of 132 potential respondents. The email with the survey link was sent centrally by the CBA Study Support Center, preceded by an SMS notification. To encourage participation and prompt responses, initial email and SMS notifications were followed up a few days later. One of the study authors personally called graduates using contact details provided by CBA and sent personalized reminder text messages inviting them to complete the survey. Some intended respondents could not be reached. Confidentiality was ensured throughout the survey process. Only the study authors had access to the responses, and no personally identifiable information was collected, thereby preserving anonymity of the respondents.

The data were analysed using IBM SPSS Statistics (version 26). Spearman correlation analyses were conducted to examine the relationships between variables, and a logistic regression analysis was performed to identify predictors of active business ownership one year after graduation.

Results

The dependent variable in this study was active business ownership (the continued operation of the business established during the study period) one year after graduation. Among the 67 respondents, 59.7% (n = 40) indicated their business was active at that point, while 40.3% (n = 27) reported it was not operational one year after graduation. Respondents' current engagement in entrepreneurship at the time of the survey was also examined: 50.7% (n = 34) indicated that the business established during the study period remained active, and 49.3% (n = 33) had discontinued the business started during their studies.

To determine which factors of workplace-integrated reflective learning, other forms of support received, and individual characteristics predict graduates' active business ownership one year after completing their studies at CBA, initial correlation analyses were conducted between the

dependent and independent variables. Statistically significant correlation results are presented in Table 3.

Table 3: Spearman correlations between active business ownership one year after graduation and factors of Workplace-Integrated Reflective Learning, other support received, and individual characteristics (N = 67)

Variable	1.	2.	3.
1. Active business 1 year after CBA graduation	1.00		
2. Perceived usefulness of WIL-acquired skills for business development	.42**	1.00	
3. Entrepreneurial experience prior to studies	.40**	.31*	1.00

Note. ** p < .01; * p < .05

The results show that active business ownership one year after college graduation is significantly associated ($p < .01$) only with two of the independent variables – with the workplace-integrated reflective learning factor “Perceived usefulness of WIL-acquired skills for business development” and the individual factor “Entrepreneurial experience prior to studies.” Both factors were included in further analysis. Perceived mentor roles, perceived usefulness of reflection activities, support factors like networking, participation in grants, external funding, workshops and peer support, as well as gender and age were not significantly related to active business ownership one year after graduation and were not included in further analysis.

A logistic regression analysis was conducted to determine whether the workplace-integrated reflective learning factor “Perceived usefulness of WIL-acquired skills for business development” and the individual factor “Entrepreneurial experience prior to studies” predict active business ownership one year after college graduation. The assumptions of independent observations and a linear relationship between the independent variables and the logit were checked and met.

When both predictor variables were included in the model, they significantly predicted active business ownership one year after graduation, χ^2 (2, N = 67) = 19.38, $p < .001$. Table 4 where the odds ratios are presented, indicates that both “Perceived usefulness of WIL-acquired skills for business development” ($p = .013$) and “Entrepreneurial experience

prior to studies" ($p = .019$) significantly increase the likelihood of graduates continuing their business after college. Importantly, "Entrepreneurial experience prior to studies" emerged as the stronger predictor, with an odds ratio of 5.37, meaning that graduates with prior entrepreneurial experience were more than five times more likely to maintain their business after graduation compared to those without such experience. Meanwhile, "Perceived usefulness of WIL-acquired skills" was associated with an odds ratio of 2.52, thus doubling the likelihood of active business ownership post-graduation.

Table 4: Logistic regression predicting graduates' active business ownership one year after college graduation

Variable	B	SE	Odds ratio	p
Perceived usefulness of WIL-acquired skills for business development	.92	.37	2.52	.013
Entrepreneurial experience prior to studies	1.68	.71	5.37	.019
Constant	-3.55	1.41	0.03	.012

Though the initial correlation did not show statistically significant relationships between the dependent variable and other independent variables, it is worth noting that additional analysis revealed statistically significant associations ($p < .01$) between the factor "Perceived usefulness of WIL-acquired skills for business development" and all factors related to the perceived roles of mentoring. The results are presented in Table 5.

Table 5: Spearman correlations between graduates' perceived usefulness of WIL-acquired skills for business development and perceived roles of mentoring (N = 67)

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.
Perceived usefulness of WIL-acquired skills for business development	.41**	.40**	.49**	.36**	.37**	.35**	.36**	.37**	.36**

Notes. ** p < .01; 1. Mentor perceived as a reflector, 2. Mentor perceived as a persuader, 3. Mentor perceived as a motivator, 4. Mentor perceived as a confidant, 5. Mentor perceived as an integrator, 6. Mentor perceived as an informational supporter, 7. Mentor perceived as a confronter, 8. Mentor perceived as a guide, 9. Mentor perceived as a role model.

Since the perceived usefulness of WIL-acquired skills for business development was found to be a significant predictor of active business ownership in the regression model, the observed associations between this factor and the perceived roles of mentorship may indicate an indirect influence of mentoring on entrepreneurship, potentially mediated through the skills developed during WIL. Future studies are recommended to conduct mediation analysis to test this assumption and gain a more precise understanding of the indirect role of mentoring in the context of entrepreneurship education and business sustainability.

Conclusions and discussion

The study investigated which educational factors related to workplace-integrated reflective learning and individual factors of students predicted active business ownership one year after graduation from the CBA study programme "Management of Micro, Small, and Medium-Sized Enterprises". While several educational and individual factors were examined, authors of the study identified only two significant predictors of active business ownership: the perceived usefulness of WIL-acquired skills for business development and entrepreneurial experience prior to studies. Among these, previous entrepreneurial experience emerged as the

strongest predictor. Individuals who had entrepreneurial experience prior to enrolling in the college were more than five times more likely to be engaged in business one year after graduation. This finding supports previous research, which has shown that prior experience – whether gained through work, family business involvement, or past entrepreneurial activity – enhances practical skills, entrepreneurial self-efficacy, and opportunity recognition (Unger et al., 2011). Possibly, practical, real-world experience before formal business education reinforces knowledge gained during WIL. Also, graduates with prior business exposure may already possess entrepreneurial traits and attitudes which enhance their entrepreneurial success during and after business studies, for example, a study by Harris et al. (2007) concluded that the experiences gained from entrepreneurial exposure can be critically important to the development of positive attitudes towards entrepreneurship of business students. One practical way to build on these findings is by actively applying entrepreneurial experience during students' internships. This can include experience gained through student training companies, volunteer work in business environments, or projects related to economics or business. On the other hand, to better support the development of student entrepreneurs with different prior experience levels, it is essential to expand opportunities for peer mentorship where experienced students guide and support those who are just beginning their entrepreneurial journey – whether through one-on-one mentoring, group workshops, peer-led lectures, or open discussions. Additionally, tasks and assignments within WIL should be tailored to align with the experience and capabilities of each student. Differentiated learning ensures that both novice and advanced students are appropriately challenged and supported. Students with deeper knowledge in specific areas – such as accounting or marketing – can work alongside those who are still developing their expertise, and this collaboration can also extend beyond the program itself, with mentors from other study programmes stepping in to assist or even offer their services as part of a cooperative learning experience. These interactions create a dynamic learning environment where students benefit from each other's strengths.

Perceived usefulness of WIL-acquired skills was significantly associated with higher odds of active business ownership, doubling the likelihood, according to the regression model. These findings support previous research (e.g., Pretti et al., 2020), which emphasizes the importance

of experience-based and practice-oriented education in developing entrepreneurial skills and competencies. Therefore, higher education institutions should continue to strengthen WIL strategies, ensuring that students have opportunities not only to acquire theoretical knowledge but also to actively engage in real-world entrepreneurial situations. Such experiences provide a meaningful context for developing the skills necessary for successful entrepreneurship.

Other educational and individual factors – including the perceived usefulness of reflection activities, perceived mentor roles, support mechanisms such as networking, participation in grants or external funding, workshops, peer support, as well as gender and age – were not significantly related to post-graduation business ownership and were therefore not included in the regression model. Possibly, these factors influence business outcomes over a longer period than one year (having delayed effects) or through indirect pathways. Future studies could explore these factors using longer follow-up periods and models that explore indirect effects, such as mediation analysis or collecting data from graduates at several time points after graduation. Applying mixed methods design (e.g., supplementing surveys with in-depth interviews) could also help uncover more nuanced experiences that may be overlooked using the quantitative measures. Additionally, using more detailed response options (e.g., Likert scales instead of dichotomous items for support factors) may better capture the frequency and perceived impact of support mechanisms.

Authors note that additional correlation analysis revealed that all ten mentoring role indicators were significantly ($p < .01$) associated with the perceived usefulness of WIL-acquired skills for business development. This suggests that mentorship may have an indirect influence on graduates' active business ownership. Therefore, future studies might examine the potential mediators (e.g., perceived usefulness of WIL-acquired skills) in the relationship between mentorship and entrepreneurial outcomes among graduates. A possible indirect or mediated relationship suggested by these results, where mentorship enhances skill perception, which in turn influences business continuity, is consistent with notions by Nabi et al. (2019), who identify mentorship as a driver of both cognitive and emotional development in entrepreneurship education. Mentorship likely plays a key role in reinforcing reflective practices, building entrepreneurial confidence, and supporting skill transfer. Studying the

interaction between specific mentoring functions and WIL experiences could provide valuable insights for enhancing entrepreneurship education programs.

This study brings three key contributions to the literature on entrepreneurship education. First, it empirically links the perceived usefulness of WIL-acquired skills to the sustainability of entrepreneurial activity one year post-graduation – an area underexplored in prior research. Second, it addresses a gap in entrepreneurship education literature by focusing on graduates of a short-cycle professional program in Latvia which has been underrepresented educational context and thus adds geographic and institutional diversity to entrepreneurship studies. Third, the study introduces a replicable methodological framework for analysing the relationship between workplace-integrated reflective learning components and entrepreneurial outcomes, using a quantitative approach applied to post-graduation business continuation.

Several limitations should be considered when interpreting the results of this study. First, the relatively small sample size ($N = 67$) limits the generalizability of the findings to a broader population, including graduates of similar programmes in other contexts or countries. In addition, authors of the study acknowledge that work-integrated reflective learning is not a single, isolated input, but a complex experience cumulated and shaped by multiple interacting educational factors over time, such as mentoring, reflective activities and feedback, different support factors and individual factors, for example, female students may rely more on relational mentoring styles and benefit more from trust-based interactions. The multidimensional nature of work-integrated reflective learning makes it challenging to study using isolated indicators in studies with small samples. A larger and more diverse sample in future research would strengthen conclusions and improve the external validity of the results and allow for more robust analysis of interacting independent variables. Second, the study used a cross-sectional design, measuring entrepreneurial activity one year after graduation. Though this approach limits the ability to draw conclusions about causality, the aim of the study was not to establish causal relationships, but rather to identify predictors – factors that are statistically related to business ownership one year after graduation". A third potential limitation is the use of self-reported, retrospective evaluations of the usefulness of entrepreneurship skills as a predictor of active entrepreneurship. Respondents who were still running

a business may have been more inclined to rate these skills as useful, which could reflect their current experience and perception rather than provide objective evaluation. The data relied on self-assessments, which may be subject to social desirability bias or recall errors. A longitudinal study design – tracking graduates' entrepreneurial development over time – or incorporating objective skill assessments would help reduce these biases and address the mentioned limitations more effectively.

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Peer Feedback as a Future Competence – Improving Reflective Practice-Based Learning

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Abstract

Background

In clinical health education, limited time and resources for supervision often hinder students' development of professional competencies and reflective practice. Reflective Practice-Based Learning (RPL) emphasises peer learning and feedback as potential strategies to enhance knowledge sharing and competence development. However, empirical evidence on the strengths and limitations of peer feedback in healthcare remains scarce. This study explores how students and clinical supervisors experience formal and informal peer activities and their influence on student learning.

Method

Data were collected through six semi-structured interviews involving 32 students and 13 clinical supervisors from nursing and physiotherapy programs. Thematic analysis was conducted following Braun and Clarke's framework. Two health education students were involved throughout the research process, contributing to the development of the interview guide and the analysis.

Results

Four themes emerged: (1) Creating a safe learning environment, (2) Learning through peer activities, (3) Possibilities and limitations for peer feedback, and (4) Positions in clinical practice. Peer activities were perceived as informal and equal, fostering open dialogue, reflection,

and critical thinking. Students reported enhanced academic and clinical learning, including leadership development. However, peer learning alone may risk exclusion from the broader clinical community. The findings underscore the importance of structured frameworks, clearly defined roles, and adequate preparation for effective peer feedback. Junior students benefit from experienced peers, while senior students gain from providing feedback. Limitations include uneven responsibility distribution, skill gaps, and organisational challenges.

Conclusion

Peer learning should be viewed as a complementary approach within clinical education, supported by institutional structures and supervisory engagement.

Keywords

Reflective Practice-based Learning, RPL, Peer feedback, Peer activities, Focus group interview.

Background

In clinical practice, healthcare professionals face an increasing time pressure with insufficient time and resources for guiding students during their clinical training. The pressure is exacerbated due to more complex health issues and more advanced and available treatment in healthcare (Indenrigs- og Sundhedsministeriet, 2024). Lack of time and resources may also have implications for clinical practice due to shortage of clinical training placements (Barimani et al., 2022; World Health Organization, 2020; McKellar & Graham, 2017), lack of prioritization of student guidance in practice (Tørring & Jensen, 2022), and thus, inadequate professional supervision (Holen & Lehn, 2023). Consequently, the students may have limited time for feedback with their supervisor (Wong & Shorey, 2022), have multiple clinical supervisors (Gilmour et al., 2013; Zwedberg et al., 2020) and hence a stressful learning environment (Liquirish & Seibold, 2013; Zwedberg et al., 2020).

Lack of supervision and time for guidance in clinical practice may hamper the students' development of professional identity, decision-making skills and hinder students' professional development, learning and reflection (Severinsson & Sand, 2010). Consequently, the risk of student

attrition increases when students do not thrive and feel disconnected from the clinical education community (Rasmussen, 2010).

Higher education institutions have developed pedagogical approaches to support health students' professional development and agency to support the congruence in the transmission between campus-based teaching and clinical learning. For example, the Reflective Practice-based Learning (RPL) approach at the University College of Northern Denmark (UCN) emphasises the interplay between thinking, experience, and action to connect theory and practice (Horn et al., 2020). RPL is a profession-oriented experience-based pedagogical approach that aims to enhance students' decision-making, professional identity, judgment, and action competencies through critical reflection (Dau, 2025). RPL also fosters the student's ability to give and receive feedback and engage in peer-learning and peer-feedback processes (Nielsen et al., 2019; Tornwall, 2018).

RPL is a theoretical approach to learning, combined with six didactic principles applied to teaching, aimed at creating optimal conditions for reflection (Horn et al., 2020). The theoretical foundation posits that reflection is integral to the learning process and that learning should take place in an environment where students can experiment, think and act (Dau, 2025; Horn et al., 2020). This idea is founded in Dewey's (1938) conceptualisation of experience as a basis for learning.

Peer feedback is defined as feedback provided by peers, e.g. from one student to another (Hattie & Timperley, 2007; Henning et al., 2006). The most widely used definition in international research originates from British education researcher Keith Topping (1998), who defines *peer assessment* as a situation in which students evaluate the quantity, value, quality, or success of their peers' products, outcomes, or learning. In this knowledge synthesis, we employ the term *peer feedback*, as it is more commonly used in a Danish educational context, where pedagogical practice tends to emphasize the feedback itself and its potential to enhance student learning, rather than the assessment of peers' performance (Danmark's Evalueringsinstitut, 2021). Following the definition, the focus of the article is healthcare students' formal and informal activities among peers to reveal understandings beyond the definition of peer feedback in clinical education.

Numerous studies suggest that peer feedback activities support knowledge sharing, confidence, learning, judgment, and competence

development (Davis & Richardson, 2017; Foulkes & Naylor, 2022; Wong & Shorey, 2022). Effective peer feedback requires careful planning and organisation (Foulkes & Naylor, 2022). Junior students may benefit from participating in activities alongside senior students in clinical settings, enhancing their future roles as mentors and collaborators (Wong & Shorey, 2022; Markowski, 2021). For graduates, activities such as peer feedback support developing skills, enhance patient care quality, and create a safe healthcare environment (LeClair-Smith et al., 2016). It also provides multiple perspectives and more feedback than any single instructor can offer (Tornwall, 2018).

Limited evidence exists on how students and clinical supervisors experience formal and informal activities among peers and their influence on students' learning. This paper addresses the following research question:

How do students and clinical supervisors experience formal and informal activities among peers and their influence on students' learning?

Methods

The findings in this article stem from a practice-oriented research project investigating how peer feedback activities contribute to a rich learning environment using RPL in clinical practice. The overall project includes three sub-studies: (1) a literature study on peer feedback in Nursing, Radiography, Midwifery and Physiotherapy; (2) a qualitative study based on focus group interviews with students and clinical supervisors; (3) and an intervention study testing structured peer feedback. The overall project is based on student involvement. Thus, two students participated in the interview, read transcripts, suggested codes and themes, and helped verify the final themes.

The present paper reports findings from sub-study 2 and leans upon the findings from sub-study 1 in the background and discussion. For sub-study 2, a qualitative study designed with focus groups was chosen to gather diverse perspectives, understand attitudes, and explore ideas regarding formal and informal activities and peer feedback across groups of students and clinical supervisors (Baillie, 2019).

The focus group interviews were based on a semi-structured interview guide made by the research group and with input from the two students. The interview guide was used as a template to make sure the research questions were explored. However, the main intention was to be as open-minded as possible by asking questions regarding formal and informal activities with peers, instead of providing the participants with any predefined definition of the concept of peer feedback (Brinkmann & Kvale, 2018).

Recruiting

A sample of students from the nursing and physiotherapy education was recruited from the UCN. Moreover, a sample of clinical supervisors from the clinical practice sites affiliated with UCN and with experience in clinical education of nurse or physiotherapy students at different educational levels was included.

Inclusion criteria for students at various levels were experience with at least one period of clinical education. Exclusion criteria were not being able to speak and understand Danish.

Inclusion criteria among supervisors were experience with students at diverse levels of health education within nursing and physiotherapy.

Analysis

To identify themes, Braun and Clarke's (2022) thematic analysis was used. Reflection allowed the researchers to critically reflect on their involvement and acknowledge their own influence throughout the process. Data was derived inductively through the following six steps.

(1) Transcriptions were read and re-read to familiarize with the data and note initial ideas; (2) Codes were generated from these ideas, and relevant text phrases were collected for each code; (3) Codes were sorted into potential themes; (4) Themes were reviewed to ensure they worked with the coded extracts and the entire data set, creating a thematic map; (5) Themes were defined and named, refining the specifics and generating clear definitions and names; (6) Results were presented (Braun & Clarke, 2022).

In the first phase of the analysis, all authors familiarised themselves with the data and discussion of the preliminary ideas for codes. All co-authors contributed initial codes, which were discussed in two meetings. We agreed on a set of codes and marked relevant text excerpts.

The codes were then condensed and merged into four broader themes through collaborative interpretation. Subsequently, two authors, CBT and LSN, were responsible for steps 2 through 5. Throughout this phase, they maintained an ongoing dialogue with the remaining authors, ensuring a cohesive development of the themes. The students, who had each participated in a focus group and reviewed the transcripts, also contributed to a discussion on codes and themes. This interaction served to both inspire the authors and provide a means of validating the initial findings. Nederst på formularen

Ethics

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki (World Medical Association, 2001). In Denmark, qualitative studies do not need further approval from the Ethics Committee. All participants were given both oral and written information about the study, and informed written consent was obtained before participation. Confidentiality and anonymity were secured. It was emphasised that participants could withdraw their consent at any time without consequences.

Results

In fall 2023 (24th October-7th November) six focus group interviews were conducted, with an average duration of 46 minutes. Four focus group interviews were conducted with a total of 32 students from 3rd and 7th semesters of the nursing programme and 2nd and 6th semesters of the physiotherapy programme, respectively. Two focus group interviews with 13 clinical supervisors, six from the nursing education and seven from physiotherapy were also conducted. All clinical supervisors had a minimum of two years' experience as supervisors in clinical practice. The most experienced had 16 years of experience as supervisors.

Table 1: Participant characteristics

	Nursing programme			Physiotherapist programme		
	Students		Supervisors	Students		Supervisor
	Third semester	Seventh semester		Second semester	Sixth semester	
Number of participants (Female/ Male)	11 (9/2)	8 (8/0)	6 (6/0)	6 (5/1)	7 (5/2)	7 (4/3)
Duration of interview (minutes)	38	48	40	52	47	50

In this study, our primary aim was to reveal the student's thoughts and reflections on their placement experiences, without explicitly probing their understanding of the concept of peer feedback during the interviews. This approach entailed different perspectives on the learning setting during the placement, highlighting the difference between nursing and physiotherapy students. Nursing students predominantly use the word reflection while students from physiotherapy use the word peer learning, with only one specifically mentioning peer feedback. The lack of direct mention of peer feedback could be attributed to the RPL at UCN, which encourages students to engage in a reflective discourse. Despite this potential limitation, we gained valuable insight into students' peer learning practices during their placement periods.

Four major themes appeared: 1) Creating a safe learning environment, 2) Learning through peer activities, 3) Possibilities and limitations for peer feedback, 4) Positions in clinical practice.

Theme 1: Creating a safe learning environment.

The students experience the interactions with fellow students to foster informal and equal relationships during learning activities (Speaker 4, 2nd. semester, physiotherapy) which encouraged open discussions and reduced barriers, compared to interactions with a supervisor. Students felt more comfortable discussing official and casual topics, expressing

doubts and asking questions perceived as trivial, in a more relaxed tone, contributing to positive peer relationships:

“It makes you dare to ask those questions that you might not always dare to ask when the clinical supervisor is there. You get an opportunity to ask the silly questions” (Speaker 8, 7th semester, nursing).

From the clinical supervisor's perspective, these activities support a culture of learning among colleagues.

“If you learn from your study time that peer learning is a part of everyday life, it will do something for the culture in general among colleagues” (Speaker 7, clinical supervisor, nursing).

Peer activities were particularly beneficial in complex clinical situations or where the students received limited guidance from supervisors:

“In the second semester, I didn't have a great relationship with my supervisor, but a sixth-semester student took me under her wing. It was really nice to have a student as a support person, someone I could always go to, especially since the supervisor was rarely around, and we only met for an hour a week during actual supervision” (Speaker 3, 7th semester, nursing).

Interactions with fellow students were perceived as more of a two-way exchange, unlike the more question-answer format, where the supervisor is seeking a specific answer.

“When you interact with students, it's more of a two-way exchange. With a clinical supervisor, you often have to come up with the answers and figure out what they want. But with fellow students, it's a mutual exchange. That's what I really liked” (Speaker 2, 2nd semester, physiotherapy).

Overall, the findings indicate that peer interactions are perceived as informal and equal, fostering a more comfortable environment for discussion and enhancing the opportunity to ask questions. In the absence of a supervisor, students are more inclined to openly discuss their doubts.

Theme 2: Learning through peer activities.

Students reported that peer activities supported both academic and practical learning. Junior and senior students benefit from discussing theoretical aspects within a clinical context, which also serves as exam preparation exercises. These activities improved the students' skills in teaching, debating and reflection. Collaborating with a fellow student fosters dialogue and the exchange of ideas, thereby enhancing the understanding.

“To explain theoretical or clinical issues to others, you must increase your reflection and learn to explain it ... Of course, you also practised applying theories for exams, but it also became very clinically oriented. So, I clearly think it can promote learning and the way you support each other as students” (Speaker 8, 7th semester nurse).

Peer activities also support the development of clinical leadership, as students learn to delegate and take responsibility for tasks.

“Also learning to delegate tasks and ensure they are followed through. And for her to be responsible for these tasks with me as someone who could support her if needed (Speaker 8, 7th semester nurse).

Clinical supervisors noted that when peers from other departments accompany the students, they gain an overall view of the patient trajectory, enhancing their overall learning experience. Collaborating with senior students provided awareness of their own learning path through comparisons with more experienced students. However, some students expressed concerns that excessive peer activities could lead to a feeling of not being a part of the community of practice.

“I think there is a risk that it comes down to a division between the students and the staff. I try to step out of the student role to become part of the staff ... it worries me that it might end up becoming a club of students” (Speaker 2, 7th semester, Nurse).

In summary, peer activities were found to support both academic and clinical learning, enhancing, debating and clinical leadership in addition to insight into patient trajectory and students' own learning path.

However, an overemphasis on peer activities may lead students to feel excluded from the broader clinical community.

Theme 3: Possibilities and limitations for peer feedback.

The organisation of peer activities varies by location, with some clinical settings planning them while others offer different opportunities for peer interaction.

Possibilities

Regardless of the nature and frequency of the activities, both students and clinical supervisors agreed on the importance of clear frameworks, structure, and guidelines for peer feedback activities. Defined roles and explicit requirements were deemed essential to prevent misunderstandings and to manage the varying abilities of junior students in receiving feedback.

“Peer feedback requires some structure. There needs to be guidelines, a framework to work from, so that nothing is misunderstood” (Speaker 6, 6th semester Physiotherapy).

Junior students often find sparring with more experienced students instructive, especially when they have doubts. However, students at similar educational levels share more common thoughts and issues, making it easier to speak up. Senior students found it beneficial to give feedback to junior students, as it leverages their experience and encourages them to explore areas, they are unsure about, translating theory into practice.

“There was a third or fourth semester student in the xx-department with me. She was really good at pushing me in a challenging way, making me reflect on things. She asked questions I couldn’t answer, so I had to look them up. (Speaker 6, 7th semester Nursing).

Some senior students emphasize the value of starting with a practice case or problem relevant to the individual, although structured processes may sometimes hinder this.

“I was just there as a fourth-semester student and participated in the weekly reflections, which had a predetermined topic. And I thought

that was a bit unfortunate because then I felt that I couldn't talk to my supervisor about what I needed, because it was decided that this was what we were going to talk about" (Speaker 8, 7th semester, Nursing).

Clinical supervisors highlighted the importance of understanding the individual students' personalities to match them appropriately, ensuring that peer activities benefitted all involved.

"When I supervise first-semester students, I get to know them. Then, in the second semester, I focus on personality for pairing, so if second-semester students are challenging, I match them with a fourth-semester student who can handle it" (Speaker 2, Clinical Supervisor, physiotherapy).

Thus, clear frameworks, structure, and guidelines for peer activities are considered essential by both students and clinical supervisors. Defined roles and explicit feedback requirements help to manage the varying abilities of junior students. Junior students benefit from sparring with experienced peers, while those at similar levels find it easier to discuss common issues. Senior students gain from giving feedback, applying theory to practice. Starting with relevant practice cases is effective, although structured processes can sometimes limit this. Clinical supervisors emphasise understanding individual student personalities for appropriate matching.

Limitations

Junior students often struggle to effectively engage unless senior students are adequately prepared and motivated. Lack of motivation or preparedness from senior students may hinder the learning opportunities for junior students, as the absence of prior planning can lead to confusion: "Well, shall I be accompanied by you?" (Speaker 3, 2nd semester physiotherapy). This statement underscores the need for clear roles and responsibilities in peer activities.

Senior students may find themselves overwhelmed and disrupted by the responsibility of working with junior students, particularly in the absence of adequate support and structure, leaving them feeling as though they must navigate the mentoring on their own, expressing that teaching

others may be beneficial, but it can also be disruptive to their own learning:

“It was beneficial in a few parameters – that is, in terms of teaching others. But for me, it was very disruptive” (Speaker 4, 7th semester, Physiotherapy).

Feedback requires pedagogical insight and communicative skills. Students often find it easier to provide feedback to peers with whom they have a close relationship. When feedback is given to others, it requires a more pedagogical approach to avoid discouraging the recipient.

Some students experience giving feedback on activities as enriching, as opposed to others, who emphasise being pedagogical to avoid the recipients feeling they did everything wrong.

“So, we were very unsure about how much criticism we could actually give, to avoid completely undermining their confidence.” (Speaker 2, 6th semester, Physiotherapy).

Clinical supervisors highlight the risk of learning errors, especially among students who struggle in certain areas. Their involvement is essential to ensure a reasonable educational level and to prevent learning errors. However, supervisors often face organisational challenges, such as time constraints and logistic issues, which can impede their ability to oversee peer activities effectively:

“Yes. What can be challenging ... if you have a student who struggles in some areas, they might end up learn something that is not correct. There, you must intervene, but my experience is that I do not have time to oversee all peer learning activities” (Speaker 6, Clinical supervisor, nursing).

Overall, the limitations of peer learning in clinical education are multifaceted. Junior students' reliance on senior students, overwhelming responsibility felt by senior students, the required pedagogical and communication skills, and the organizational challenges faced by supervisors all contribute to the difficulties in effective peer activities.

Theme 4: Positions in clinical practice.

Peer activities in clinical education may involve complex dynamics of competition, power asymmetry, and hierarchical positioning, which can impact the learning experience. Competition between students, especially those at the same level or between junior and senior students, can create tension and hinder collaborative learning. Clinical supervisors have observed that some students strive to stand out and present themselves well, which can lead to conflicting roles and confusion. Therefore, the definition of roles beforehand seems important to prevent competition from becoming counterproductive:

“They both want to stand out and present themselves well. So, it’s important to act as a catalyst and tell them to decide on their roles with the patient beforehand” (Speaker 7 Clinical supervisor, Nursing).

“In clinical practice, you aim to learn as much as possible and engage in areas of interest, just like other students. So, you’re mindful of whose toes you might step on and whether you’ll get the experiences you hope for” (Speaker 2, 6th semester, Nursing).

In some cases, one student may dominate the peer activity, leading to the other student’s withdrawal and hence perceiving the activity as less meaningful:

“I enjoy being the only one, but I’m also worried, like you mentioned, that someone else might dominate the conversation. But I do like having my own space” (Speaker 2, 7th semester, Nursing).

The management of power dynamics and asymmetry seems to be a challenge in clinical practice. Senior students must remember the limited knowledge and experience of junior students, which can lead to harsh feedback and negative experiences. A supervisor emphasised the need for moderation:

“Well, I think when sixth-semester students give feedback to first-semester students, they often forget how little you know at that stage. They can be a bit harsh. So, I always step in as a moderator, but it

doesn't always turn out to be a good experience" (Speaker 7, Clinical supervisor, physiotherapy).

Quiet students, who may be reluctant to speak up, face additional challenges in peer activities. Clinical supervisors recognise the need to create a supportive framework that encourages participation from all students:

"But if we could create a framework and support it, that would help. We try daily to encourage them to speak up, but it's difficult, especially with those who are reluctant to say anything" (Speaker 4, Clinical supervisor, physiotherapy).

The hierarchical nature of clinical settings further reinforces the asymmetry experienced by students. Patients and health professionals may inadvertently contribute to this hierarchy by engaging more with senior students or qualified professionals, leaving the junior students feeling sidelined:

"There's a bit of a hierarchy when you're out there. Patients tend to talk more to fourth or fifth-semester students. But if a 'real' physiotherapist is present, they usually take charge, and it's hard to step up" (Speaker 4, 2nd semester, Physiotherapy).

Overall, the positioning of students in the clinical practice involves navigating competition, power dynamics, and hierarchical structures. These factors may lead to student withdrawal and a perception that learning situations are not meaningful. To address these challenges, there is a need for frameworks and models that facilitate equitable peer feedback and support all students in their clinical educational journey.

Discussion

The purpose of this study was to answer the research question: *How do students and clinical supervisors experience formal and informal activities among peers and their influence on students' learning?*

Our findings indicate that interactions among students are perceived as informal and equal, fostering a conducive environment for discussion. In the absence of a supervisor, students are more inclined to openly

express their doubts. Comparable results have been observed in other studies. For instance, a qualitative study from Sweden (Zwedberg et al., 2021), involving interviews with 15 midwife students in a peer-learning model during clinical placement in three different hospitals and obstetric units in Stockholm, revealed, that an open and safe atmosphere among peers enabled students to discuss more freely and constructively than with their preceptors. Additionally, a systematic review and qualitative synthesis by researchers from the University of Greenwich, London, UK, (Markowski et al., 2021), highlighted that peer support mitigates stress, anxiety and other challenges in clinical education. These findings suggest that peer activities contribute to a supportive and safe learning environment.

Our findings demonstrate the value of practice cases or problems as a starting point for peer activities, aligning with RPL, where peer activities are considered to provide in-time authenticity in discussing and addressing real-life problems, essential for guiding professional judgement (Dau & Nielsby, 2021). The integration of ethics, work, labour and thinking forms the foundation for the development of reflective practice and professional judgement (Arendt, 1958).

Enabling students to reflect peer-to-peer from their own experiences aligns with one of the principles from RPL, which incorporates students' own experiences into teaching and learning activities, which can support the learning process (Horn et al., 2020). Furthermore, our findings indicate that students perceive peer activities as supportive of both academic and clinical learning. The Swedish study by Zwedberg et al. (2021) corroborates our results, highlighting that a share critical approach and common critical approach and the same theoretical education, the students were able to discuss how certain situations were managed in the obstetric units. Critical enquiry and reflection meant that the students got a new perspective on learning when working in pairs on an equal level (Zwedberg et al., 2021). In agreement with the study by Zwedberg et al. 2021) our research suggest that peer-activities can aid students in clinical learning to delegate tasks and practice clinical leadership. However, the transferability of the Swedish study to a Danish context may be limited, as the Swedish midwifery education program is a master's degree, whereas our findings are based on a bachelor's level health professional educational programme. Furthermore, our study includes students at various stages of their education, while the Swedish study focus-

es on students in the final part of their education. We also found that an overemphasis on peer activities may lead to feelings of being excluded from the broader community of practice.

To understand the significance of this, it is relevant to consider Lave and Wenger's theoretical analysis of learning in communities of practice (Lave & Wenger, 2003). They propose that learning occurs through interaction with others in social contexts, with the concept of "legitimate peripheral participation" highlighting that the learning process requires accepted participation in the community of practice. This participation is both a condition for learning and a fundamental component of its content (Lave & Wenger, 2003). Lave and Wenger also emphasize the role of contradictions as a fundamental developmental dynamic, where tensions between "newcomers" (students) and "old timers" (health professionals) continuously foster learning (Lave & Wenger, 2003).

Furthermore, the results reveal that positioning in clinical practice is shaped by competition, power dynamics, and hierarchical structures, which can lead to disengagement and a sense that learning lacks meaning. To counter this, educational models must promote equitable peer feedback and inclusive learning environments. Looman et al. (2022) reveal that constructive power dynamics, where equity and openness guide interactions, may foster fearless learning. This requires students and educators to become aware of implicit beliefs and make them explicit, encouraging collaborative learning and involving supervisors to support safe and meaningful engagement. Clinical agreements should reinforce these practices to ensure all students benefit from clinical education (Looman et al. 2022).

It can thus be argued that peer activities should not stand alone as a learning model in the clinical part of the education. Students should simultaneously have the opportunity for "legitimate peripheral participation" in the community of practice, thereby achieving the associated learning benefits. This perspective is supported by the Swedish study (Zwedberg et al., 2021), which emphasises the importance of viewing peer activities as a supplement to students' learning rather than a replacement for it.

Our study demonstrated that both students and clinical supervisors generally agree on the necessity of a clear framework, structure, and guidelines for peer feedback activities. It is important that students' roles are clearly defined, and there should be an explicit requirement for pro-

viding feedback. The previously mentioned meta-synthesis (Markowski et al., 2021). Also, it underscores the importance of a proper introduction to peer activities. The study indicates that teaching and training in peer learning is essential, as they involve a shift in the approach to guidance for both students and preceptors. Preceptors found it beneficial to have access to a range of resources, such as handbooks and e-learning materials. Therefore, we can interpret that for peer activities to be successful, they must be well-prepared and supported by clear frameworks, structure and guidelines.

Discussion of the method

Involving students in the entire research process, from discussing the interview guide to analysing interview text, proved to be beneficial. This comprehensive engagement became research-oriented competence-building for students. Furthermore, their involvement fostered collaboration and contributed to the overall quality and depth of the research by maintaining the practice-oriented reality that students are a part of.

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Conclusion

The findings reveal that peer activities are perceived as informal and equal, fostering open discussions and inquiry. Without a supervisor, students express doubts more freely. Peer activities enhance academic and clinical learning, debates, leadership, and insights into patient trajectories. However, excessive focus on peer activities may lead to exclusion from the broader clinical community. Clear frameworks and guidelines seem to be essential, with defined roles and feedback requirements. Junior students seem to benefit from experienced peers, while senior students gain from providing feedback. The limitations connected to peer activities include reliance on senior students, overwhelming responsibility, necessary skills, and organisational challenges.

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Reflecting for Change: How Pedagogical Diploma Assignments Become Reflective Boundary Objects for Change of Practice

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Abstract

This study explores how pedagogical diploma assignments act as reflective boundary objects that support teachers in transforming their practice. Drawing on 212 assignments written by in-service teachers participating in a workplace-embedded diploma program in a Danish municipality, the study investigates how teachers reflect on and initiate pedagogical change by asking the following research questions:

1. Which pedagogical practices do the teachers notice and choose to investigate – and how?
2. What improvements to their own practice do they bring forward as a result of their investigations?

Anchored in Dewey's pragmatism, Benner's praxeological approach, and Mason's theory of noticing, the analysis reveals that teachers frequently focused on differentiated instruction, student motivation, inclusive practices, and classroom dynamics. These investigations lead teachers to critically examine their teaching through self-initiated inquiry. The assignments not only document changes in teaching methods but also demonstrate a shift in teachers' professional self-understanding and conceptual framing of pedagogy. Teachers often narrate their learning processes, linking personal experiences to broader educational theories, thereby bridging formal coursework with the realities of everyday class-

room practice. The findings highlight the transformative potential of diploma assignments when integrated within institutional models like the University School, which supports situated, autonomous inquiry. These reflective artifacts serve as tools for noticing, principled experimentation, and ethical reflection, enabling teachers to engage deeply with their practice. The study contributes to the field of reflective teacher education by presenting a model of partnership-based profession-didactical learning that emphasizes teacher agency and boundary-crossing reflection. It suggests that structured, experience-based inquiry can lead to meaningful, context-sensitive pedagogical development when embedded in supportive professional environments.

Keywords

Teacher Education, Pedagogical Development, Reflective Practice, Boundary Objects, Noticing

Introduction

Reflective Practice-based Learning (RPL) has emerged as a way to rethink how educators engage with their professional development, particularly in bridging the often-cited gap between theory and practice in education (Illeris, 2009). As educational systems worldwide grapple with the demands of preparing teachers not only for the classroom but for continuous pedagogical innovation, RPL offers a framework that foregrounds experiential learning, critical reflection, and situated inquiry. Rooted in traditions established by Schön (1983) and Dewey (2005), RPL emphasizes the cyclical relationship between action and reflection, whereby professionals actively interrogate their practices to generate meaningful insights and drive transformation (Horn et al., 2020). This paper contributes to this discourse by examining the role of pedagogical diploma assignments as reflective boundary objects (Star & Griesemer, 1989) meaning artifacts that mediate between formal educational structures and evolving professional practices. The empirical basis for this investigation is a large-scale professional development initiative undertaken in a southern Danish municipality. Teachers and subject-specific coaches from 20 schools participated in a workplace-embedded diploma program designed to foster reflective inquiry into their own teaching practices. Central to this program was the production of individual di-

ploma assignments, which served not only as academic deliverables but as structured opportunities for practitioners to investigate, theorize, and improve aspects of their pedagogical work. These assignments thus constitute a unique dataset that offers insights into how educators notice, interpret, and act upon challenges in their practice. The aim of this study is to explore how these pedagogical assignments mirror institutional learning and localized professional development. Specifically, we analyze 212 diploma assignments to address the following research questions: (1) Which pedagogical practices do the teachers notice and choose to investigate and how? (2) What improvements to their own practice do they bring forward as a result of their investigations?

Our findings offer a grounded understanding of how reflection is operationalized in professional learning, what types of knowledge are foregrounded in teachers' inquiries, and how formal educational outputs can serve as levers for sustainable change in practice.

Theoretical conceptions

This study is grounded in a profession-didactical perspective that conceptualizes pedagogical diploma assignments as objects for engaging in reflective, practice-based experimentation. Drawing on the University School model (Hachmann et al., 2023; Albrechtsen et al., 2024) our approach aligns with a pragmatic educational philosophy inspired by Dewey (2005), emphasizing experience, inquiry, and the learner's capacity for development (Bildsamkeit). Within this framework, campus-based learning and school-based practice are understood not as separate domains but as expanded frames (Engle, 2006) that invite practicing teachers into complex, pedagogical situations. These frames foster a productive tension between theoretical insight and practical experience, requiring participants to not only act but reflectively justify their actions in light of professional and educational principles. At the core of this perspective is Benner's (2015) praxeological approach to pedagogical experiments. These are not controlled trials but reflective actions initiated in response to unforeseen, situational demands in practice. A pedagogical experiment in this sense emerges when the practitioner, faced with pedagogical challenges, chooses to act based on practical principles rather than predetermined protocols. Benner argues that such principles are "basic conceptions qualifying the discussions about content" (2015,

p. 62), offering an interpretive compass to distinguish between legitimate and illegitimate actions within complex pedagogical landscapes. This understanding reinforces our treatment of diploma assignments as documented traces of such experiments: moments where teachers attempt to articulate the ‘why’ behind their ‘what’, situating their decisions within broader frameworks of professional reasoning.

To understand how teachers become attuned to such moments and capable of reflective experimentation, we incorporate Mason’s (2002) discipline of noticing—a phenomenological methodology for sensitizing practitioners to their own perceptual and cognitive patterns. Noticing is framed here not merely as perception but as an intentional act: noticing that something occurs and, more crucially, noticing for action. Building partly on Schön (1983) Mason’s work emphasizes the recursive nature of noticing—how it is cultivated over time through disciplined reflection and dialogic engagement, making practitioners more responsive and generative in their pedagogical thinking. This theoretical move aligns with our empirical interest in what teachers choose to notice and reflect upon in their assignments, and how these choices shape their sense of agency and capacity for change. The intersection between Benner’s praxeology and Mason’s noticing highlights a vital dynamic: the act of reflecting on pedagogical events is not a post-hoc rationalization but an intrinsic part of professional inquiry. This is further enriched by the notion of expanded framing (Engle, 2006), which conceptualizes learning environments as interconnected spaces that support the transfer and transformation of knowledge across institutional boundaries. In our study, diploma assignments serve as boundary objects that mediate this expansion. They are authored within academic contexts but rooted in real-world classroom events, prompting a dialogue between theory and action, between theory and profession (Star & Griesemer, 1989; Akkerman & Bakker, 2011). Importantly, this reflective process is not ideologically prescriptive. Instead, it respects the existential dimensions of teacher development, allowing practitioners to construct their own professionalism and practice through inquiry and experimentation. This aligns with Biesta’s (2015) critique of technical-rational approaches to school practice and his call for more educationally constitutive practices that honor the complexity of becoming and being a professional teacher. The University School model embodies this ethos, offering a space where professional development is driven not by compliance with pre-

determined methods but by engaged, context-sensitive inquiry rooted in the teacher's own experiential terrain (Carlsen et al, 2024).

In summary, our theoretical framework positions pedagogical diploma assignments as both reflective artifacts and active mediators of professional growth. They embody the convergence of noticing, principled action, and boundary-crossing inquiry, grounded in a pedagogical stance that values autonomy, reflection, and situated experimentation. This framework enables us to explore how teachers come to see their own practice as a site of inquiry—how they learn to notice, reflect, and act with greater intentionality and educational sensitivity.

Methods and analytical framework

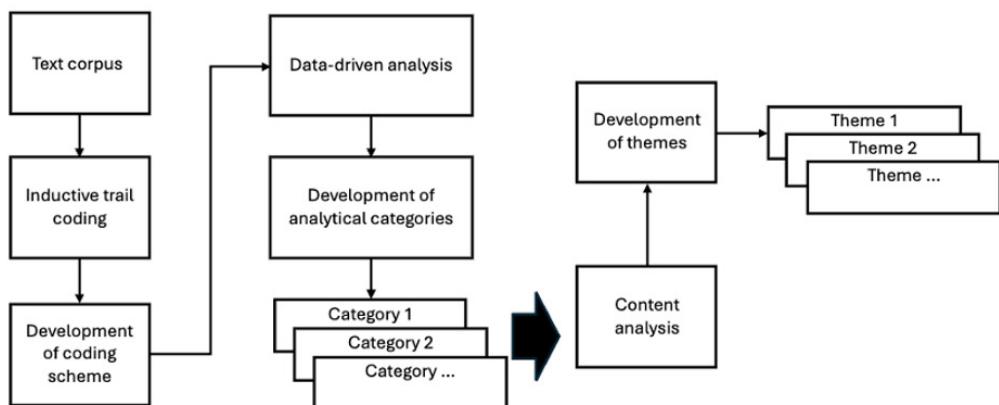
This study adopts a qualitative, document-based approach to investigate how pedagogical diploma assignments written by in-service teachers function as reflective boundary objects and praxeological experiments. Situated within the University School model and its profession-didactical orientation, the research design is informed by a pragmatic epistemology (Dewey, 2005), emphasizing inquiry embedded in lived experience.

The empirical material comprises 212 diploma assignments written by teachers and subject-specific coaches participating in a large-scale, practice-embedded continuing education initiative in a southern Danish municipality (2020–2024). The initiative aimed to contribute to the development of even more inquiry-based and experimental teaching practices with the meaningful integration of IT (Formål og ansøgning – Universitetsskolen). The diploma program was designed to be workplace-based, integrating theoretical coursework combined with participants' ongoing small-scale experiments in their daily teaching practice. As part of the program requirements, participants submitted final written assignments that documented their pedagogical inquiries, interventions, and reflections. The assignments serve multiple purposes across different contexts and can be viewed from various perspectives (Duch, 2021). For the student — that is, the teacher participating in the professional development program — the study context and the assessment of the assignment through grading may hold significant importance. For others, the key concern is the potential impact of the inquiry through colleagues and school leaders within the school context. These and many other perspectives are legitimate and important. In this study, we

view assignments as objects of study and as analytical lenses for examining how practitioners engage in reflective inquiry within institutional frameworks. The assignments are regarded as a source of knowledge about what teachers choose to investigate under particular conditions. Consequently, we have not concerned with the grades assigned to the teachers' assignments.

Data collection involved the systematic gathering and anonymization of all available assignments completed within the project's duration. In alignment with the study's two guiding research questions the assignments were then subjected to qualitative document analysis, with a dual focus: (1) identifying the area of focus i.e., the pedagogical practices that teachers chose to investigate, and (2) categorizing the types of changes or improvements they reported making to their practice as a result of their inquiries. The layered analysis of how teachers notice, frame, and act upon problems of practice. The analytical process was iterative and inductive, drawing from Braun and Clarke's (2006) six-phase approach to thematic analysis. First, all assignments were read for general familiarization, followed by the initial coding of sections where teachers explicitly described what they noticed in their practice and what they aimed to change. These codes were refined through repeated rounds of analysis, clustered into emergent themes that captured recurring patterns across the dataset.

Figure 1: A visualization of our coding process inspired by Braun & Clarke (2006)



Given the study's emphasis on practitioner experience and reflective articulation, the validation of findings does not rest on representativeness in a statistical sense but on interpretive depth and resonance with the educational field (Lincoln & Guba, 1985). Credibility was strengthened through collaborative analysis among researchers, who reviewed a subset of assignments together to ensure consistency in thematic coding and interpretive alignment. Ethical clearance was secured through institutional procedures, with all identifying information removed and informed consent obtained for the secondary analysis of assignments.

Overall, our approach supports an in-depth understanding of how teachers conceptualize and document their reflective inquiries within their practice. The assignments are treated not only as evidence of individual learning but as pedagogically generative texts that inform broader discussions about professional growth, reflective teaching, and the role of institutional scaffolding in practice-based education.

Findings

As described, the professional development program had an explicit focus on the development of inquiry-based teaching within the subjects of Danish, mathematics, and special education programs. We therefore expected that the teachers' curiosity would be directed towards these phenomena; however, the analyses show that the teachers chose to investigate a range of different pedagogical practices. The analysis of the 212 pedagogical diploma assignments reveals a rich tapestry of teacher-initiated inquiries, each embedded in localized professional challenges. Guided by our two central research questions, we present the findings in two major thematic domains: (1) the pedagogical practices teachers chose to investigate; and (2) the improvements they reported—the improvements enacted or envisioned as outcomes of their reflective inquiries.

What Teachers Notice and Investigate

The diploma assignments provide insight into what teachers found pedagogically significant or challenging in their daily work. Across the dataset, several recurrent thematic clusters emerged, often overlapping and contextually entangled. The table below systematically summarizes the

identified themes, examples of subcodes, and examples from the data material.

Figure 2: Visualization of the thematic analysis

Theme	Subcodes (examples)	Examples from the data
1. Motivation	Increasing students' motivation Motivation through inquiry-based teaching	“Can students' written motivation and engagement be strengthened through the use of the online writing tool Book Creator?” (k_5_læ_da_1) “Can playful and inquiry-based teaching approaches help increase motivation for practicing methods and basic skills in mathematics?” (K_3_læ_ma_1)
2. Multimodality	Multimodal student productions (e.g., BookBento, Book Creator) Digital tools (e.g., GeoGebra, Co-Spaces)	“Can the digital program Co-Spaces support literature teaching in Danish so that students become more exploratory and experimental in their learning?” (K_20_ve_it_1) “Does the integration of multimodal student productions such as BookBento in literature teaching enhance students' motivation for reading at the intermediate level, with particular focus on grade 6?” (K_2_vejl_da_1)
3. Writing and Oral Skills	Increasing motivation for writing Supporting oral participation	“How can I explore whether a creative, interdisciplinary opening to the writing process motivates students to write?” (k_15_læ_da_8) “Can videos be used to promote students' oral skills in mathematics teaching?” (k_9_læ_ma_2)
4. Well-being, Relationships, and Self-esteem	Enhancing students' self-esteem Relationship and community building	“How can we contribute to developing young people's self-esteem and self-confidence?” (K_3_læ_da_6) “What is the relationship between teacher-student relations and motivation among students with socio-emotional difficulties?” (k_4_læ_sp_13)

Theme	Subcodes (examples)	Examples from the data
5. Inquiry-based and Differentiated Teaching	Inquiry-based approaches in Danish and mathematics Differentiated instruction	“Does an inquiry-based and dialogue-centered approach to literature affect students’ engagement, motivation, and persistence?” (K_6_læ_da_3) “What are students’ views on good teaching — including their needs for classroom management, variation in teaching, differentiation, and involvement in lessons?” (K_18_læ_ma_2)
6. Special Needs and Inclusion	Inclusion of students with special needs Language and communication challenges Dyslexia support	“How can regular use of outdoor education contribute to personal development and academic learning among students with special needs?” (k_4_læ_da_7) “How can I incorporate iPads in poetry analysis in ways that support the learning of students with dyslexia?” (K_3_læ_da_5)
7. Collaboration	Team collaboration Co-teaching	“How can storytelling from practice strengthen team collaboration around students with disabilities?” (k_4_læ_da_12) “How does the team collaborate with parents?” (k_4_læ_sp_7) “What is the impact of co-teaching on students’ well-being and academic outcomes?” (k_5_læ_al_1)

One prominent area was differentiated instruction, frequently explored through questions of how to better accommodate diverse learner needs in heterogeneous classrooms. Teachers described challenges in balancing support and challenge and experimented with varied instructional modalities, scaffolding techniques, and learner autonomy to enhance differentiation. Another prevalent focus was pupil motivation and engagement, particularly in reading and literacy across subjects. Teachers often used pupil feedback and observational data to notice disengagement, prompting investigations into multimodal texts, gamified reading experiences, or thematic cross-curricular projects. Similarly, inclusive education practices surfaced as a key areas, with educators reflecting on how classroom structures, routines, and materials either supported

or excluded specific learner needs—socially, emotionally, or cognitively. A third domain was classroom culture and relational dynamics, with teachers exploring how classroom interactions shaped learning environments. This included inquiries into authority and pupil voice, classroom agreements, socio-emotional learning, and teacher presence. Co-teaching and collaboration with colleagues also emerged as sites of inquiry, reflecting a broader organizational orientation to reflective practice and shared professional learning.

From an overall perspective, our analysis shows that what teachers noticed and their pursued inquiries were not based on institutional mandates but on felt needs arising from their embodied experiences in classrooms. They often framed their inquiries around moments of uncertainty, dissatisfaction, or curiosity—aligning with Benner's (2015) view of pedagogical experiments as situated responses to real-time pedagogical disruptions.

What Teachers Change or Envision Changing

The second analytical strand centred on what teachers claimed to have changed or aimed to improve through their developmental work. These responses revealed both immediate classroom-level changes and more abstract shifts in pedagogical thinking and, to some extent, changes in professional identity. Many teachers reported changes in how they designed lessons and organized classroom activities. Examples included more structured pre-assessments to inform differentiated planning, incorporation of new instructional materials (e.g., visual aids, graphic organizers), or altered physical layouts to support Pupil interaction. Several teachers noted a move toward more dialogic and pupil-centered teaching, creating space for peer learning and metacognitive reflection among Pupils. Some educators articulated changes in their ways of seeing their pupils and their teaching. They reported increased sensitivity to classroom dynamics, a more nuanced understanding of learner diversity, and a heightened awareness of the assumptions underlying their pedagogical choices. In Mason's (2002, 2021) terms, these improvements suggest not just new actions but new *noticings*, with teachers developing an expanded perceptual and interpretive repertoire. Some of the diploma assignments also revealed systemic aspirations on an institutional level, such as advocating for more collaborative planning time in their schools or mentoring colleagues using insights gained through the developmen-

tal work. In this way, the improvements moved beyond the individual to touch on institutional structures and cultures of professional development. Notably, the assignments often blended narrative and analytical modes. Teachers described their experiences richly—sometimes with emotional candor—and then linked these to broader educational concepts or theories encountered in the diploma program.

For instance, a teacher notes:

It has been an educational and exciting journey. From instruction and supervision at the University School to narrowing down the area of interest, formulating the research question, and finally choosing a data collection method, analyzing the data, and presenting the results in this assignment. I have answered my research question and can conclude that the 'Livsmesterlinjen' (Life Mastery Track) supports the pupil's well-being and, thereby, their motivation for participating in classroom teaching. (k_4_læ_da_10 o)

In this reflection, the teacher offers a deeply personal and emotionally authentic account of their developmental journey throughout the inquiry process. The experience is clearly linked to broader concepts such as pupil well-being and motivation, and how these were examined and understood through both practical experiences and theoretical insights gained during the diploma program. This illustrates a strong connection between personal experience and professional development. This combination of personal narrative and conceptual reasoning is characteristic of reflective practitioner writing and underlines the function of the assignments as boundary objects—bridging individual experience and institutional knowledge structures (Akkerman & Bakker, 2011; Star & Griesemer, 1989).

The findings suggest that pedagogical diploma assignments support a dual process: they scaffold noticing—what is pedagogically significant or problematic—and they support principled reflection leading to action. The topics chosen reflects deep engagement with the experiential dimensions of teaching, while the improvements signal a shift toward more intentional, inquiry-based practice. The assignments thus function not only as reflective documentation but also as catalysts for personal and institutional learning—supporting the claim that they are, indeed,

reflective boundary objects that mediate between the formal structures of university education and the organic complexity of school practice.

Discussion

The findings from the analysis of 212 pedagogical diploma assignments highlight the multifaceted ways in which teachers engage in reflective inquiry and enact change through situated pedagogical experimentation. This section discusses these findings through the lenses of Benner's praxeological pedagogy, Mason's discipline of noticing, and the broader theoretical framework of boundary crossing, with particular attention to how these reflective processes are supported by the University School's profession-didactical structure.

One of the most salient patterns emerging from the data is the teachers' ability to identify and pursue pedagogically significant issues rooted in their daily experiences—often those that were messy, ambiguous, or emotionally charged. These moments, when reflected upon systematically through the structure of the diploma assignment, became what Benner (2015) refers to as pedagogical experiments: actions taken in response to real-time disruptions that required practical reasoning and principled judgment. These were not random interventions but thoughtful engagements with dilemmas of practice, framed by the teachers' own developing sense of what constitutes meaningful, legitimate, and professional educational action. This reflective engagement was made possible by the structured opportunity to document and theorize their practice, indicating that the diploma assignments functioned as more than assessments—they operated as reflective boundary objects (Akkerman & Bakker, 2011; Star & Griesemer, 1989). They connected institutional demands for academic rigour with the unpredictable, relational nature of classroom practice. Within these texts, teachers moved between descriptive narrative and conceptual analysis, a movement that exemplifies the crossing of institutional boundaries and the co-construction of practice-based knowledge. The prominence of differentiated instruction, inclusion, and pupil engagement as a focus suggests that teachers are deeply attentive to pupil variability and relational dynamics. Teacher noticing became both a selective and prospective act as the teachers were not simply identifying surface-level phenomena; they were developing a refined professional gaze—an attunement to the nuances of learning

environments and an orientation toward informed pedagogical responses. In this way, the diploma assignments scaffolded and helped teachers to reframe their understandings of pupils, content, and their own roles as professionals. Resonating with the University School model's commitment to honoring the capacity of individuals to shape and be shaped through educational experiences (Benner, 2001), the improvements that teachers proposed and implemented often went beyond technical adjustments; they reflected deeper shifts in pedagogical reasoning and professional identity. Rather than prescribing solutions, the model encourages an existential approach to education, wherein teachers are afforded the space to develop their own principles of good practice through structured, experience-based reflection. The assignments thus served as sites of pedagogical formation, where professional selves were not merely affirmed but actively negotiated and reconfigured.

In sum, the diploma assignments analyzed here illustrate the generative power of reflective practitioner inquiry when supported by a pedagogically constitutive environment. They show how noticing and experimenting can lead not only to improved practice but also to deeper understandings of what it means to teach well, ethically, and responsively. In this way, they point toward a model of reflective practice-based learning that is both rigorous and humane—anchored in experience, driven by inquiry, and oriented toward meaningful educational transformation.

Conclusion and implication of our study

The analysis of pedagogical diploma assignments has revealed how structured reflection embedded in practice-based education can catalyze both individual and institutional transformation. By conceptualizing these assignments as reflective boundary objects, we have shown how teachers engage in situated noticing, principled experimentation, and professional identity development. These processes are made possible within the University School's profession-didactical framework, which affords teachers space, legitimacy, and resources to inquire into their own practice. One key implication is the potential for pedagogical assignments to be intentionally designed not just as assessment tools, but as developmental instruments that bridge theory and practice. Teacher education programs can draw from this model to scaffold assignments that require practitioners to reflect on lived pedagogical challenges, invoke relevant

educational principles, and document their processes and insights in a way that contributes to both personal and communal knowledge.

Another implication concerns the institutional structures that support or hinder reflective practice. The findings emphasize the importance of organizational support for inquiry-based learning—time, feedback, and collegial collaboration are essential for reflection to move beyond compliance and into transformation. Schools and educational systems that value teacher agency must consider how such reflective infrastructures can be sustainably embedded within continuing professional development.

Finally, the study reaffirms the value of a pedagogically constitutive approach that balances existential autonomy with profession-didactical scaffolding. In this balance, teachers are not simply implementers of fixed curricula or strategies but engaged thinkers capable of shaping their practice through disciplined noticing and principled experimentation. As educational discourse increasingly emphasizes evidence-based practice, it is crucial to remember that teacher-generated knowledge, rooted in reflective inquiry, remains a vital and underutilized resource.

Reflective Practice-based Learning, as exemplified through the work of these Danish educators, provides a compelling model for the future of practice-oriented education—one that is inquiry-driven, context-sensitive, and deeply human in its commitment to growth and transformation.

Although not within the scope of our study, institutional and structural conditions are necessary for such reflective practice to flourish. The success of the diploma assignments as reflective boundary objects depended not only on individual teacher motivation but on the affordances of the University School framework: time for inquiry, access to mentorship, and recognition of practitioner knowledge as valid and valuable. Without these conditions, the risk remains that reflective writing becomes a compliance exercise rather than a transformative practice. The implications of this extend beyond the local context of Danish school development. In an international landscape where teacher education often veers toward competency-based and prescriptive models (Biesta, 2015), this study might offer an alternative: a model of profession-didactical reflection rooted in inquiry, responsiveness, and educational responsibility. It suggests that the future of practice-oriented education lies not in narrowing the scope of teacher decision-making but in expanding the

reflective and pedagogical agency of practitioners through carefully scaffolded, situated, and principled work.

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Scaffolding Reflective Practice through VR-Mediated Mentoring of Teachers

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Abstract

Novice teachers often struggle navigating the complexities of in-service teaching practices when transitioning from education and practice, leaving them feeling unprepared without support structures. Tool-based mentoring can scaffold reflective practice by enabling teachers to collaboratively analyse video-recorded teaching episodes, supporting professional development, self-efficacy, and well-being.

This study examines the use of collaborative 360-degree video in virtual reality (360VR) as a reflective mentoring tool for novice teachers in Danish primary and lower-secondary schools. Grounded in Reflective Practice-Based Learning (RPL) and situated within a broader design-based research (DBR) project, the study focuses on how teachers and mentors experience and reflect on the potentials and limitations of immersive technologies for scaffolding shared reflection around classroom management situations.

Following each VR-mediated mentoring session, participants engaged in structured debriefing interviews, which have been thematically analysed. Four themes emerged from the analysis (1) immersion allows for re-experiencing authentic situations, (2) shared immersion affords multiple perspectives, (3) cycles of action and reflection link VR and practice, and (4) implementation perspectives. Findings highlight the potential of collaborative 360VR to mediate and scaffold reflective practice by creating an immersive, shared space for reflective dialogue. The findings however also highlight technical and organisational challenges in terms of implementation. By engaging with participants' reflections during debriefings, this paper contributes to ongoing discussions about

using immersive technologies to support newly graduated professionals' development through reflective practice.

Keywords

Teacher mentoring, Virtual Reality, Classroom Management, Reflection, 360-degree Video

Introduction

One in five new teachers in Denmark leave the public primary and lower-secondary schools within three years (Klarskov et al., 2024). Teachers often cite lacking resources and high expectations as primary difficulties, leaving them unprepared and alone in dealing with these complexities (Böwdt & Vaaben, 2021; Stokking et al., 2003; Veenman, 1984). Mentoring has been highlighted as a relevant approach, especially when moving beyond here-and-now problems and into a reflective space (Frederiksen & Halse, 2021; Harrison et al., 2005). There is then a need to rethink induction periods for new teachers, where emphasis is placed on mentoring which can scaffold shared reflection, helping novice teachers in navigating the complexity of educational practices. In this paper we use the concepts of experience, thinking, and action from Reflective Practice-Based Learning (RPL) to discuss collaborative 360 Virtual Reality as a mediating tool for scaffolding mentoring of novice teachers (Kjærgaard et al., 2021).

One way of supporting reflection during mentoring is using tools. Tools in mentoring can help structure the shared reflective process, making teachers aware of their practices and help mentors in targeting their scaffolding of reflection (Hunskaar & Gudmundsdottir, 2023). A commonly used tool for mentoring is video, giving both teacher and mentor access to the same teaching situation. Video of teachers' own teaching is beneficial for reflection, but also requires more scaffolding (Gaudin & Chaliès, 2015) – making it a good case for mentoring which is inherently built around scaffolding. In this study, we are particularly interested in 360-degree video, a format which allows for panning and tilting the viewing angle, giving access to the entirety of the classroom, rather than having a pre-defined viewing angle as with a traditional 2D camera. Given the omni-directional affordance of 360-degree video, this video format is best experienced in Immersive Virtual Reality

headsets (360VR). 360VR allows participants to experience and explore real-world scenarios, making it relevant in educational scenarios that do not just require factual learning, but also a change in learners attitudes and engagement (Pirker & Dengel, 2021). VR in general has mostly been applied in teacher training through programmed VR applications using pre-defined scenarios focused on improving procedural knowledge, rather than exploring the complex situations that teachers engage with in daily practices (Wang & Li, 2024). These programmed environments are at risk of losing out on important parts of the reflective process, as they are mostly based on individually correlating input and output of different pre-programmed strategies, not letting teachers explore their own and other's experiences and reflections. Self-reflection work with 360VR has shown that teachers becoming immersed in their own practice creates a more nuanced understanding of practice, while also allowing teachers to see themselves from different perspectives (Walshe & Driver, 2019). Less focus has however been given to collaborative 360VR, allowing teachers and mentors to jointly engage in a shared space for reflection and problem-solving (Paulsen et al., 2024). While self-scaffolding can be a beneficial approach, mentoring with a qualified mentor allows for even more nuanced perspectives, enabling teachers to gain new perspectives and re-frame their own perspectives (Paulsen & Davidsen, 2024). In order to guide our paper, we then ask:

“How do teachers and mentors experience and reflect on the potentials and limitations of collaborative 360VR as a mediating tool for scaffolding reflective practices?”

In seeking to answer this question, we wish to contribute to an understanding of how immersive technologies may support the scaffolding of reflective practices, and what it means for RPL processes in terms of experience, thinking and action (Kjærgaard et al., 2021). We use participants' accounts of their lived experiences to understand how VR technology is used to shape what can be seen, said, and reflected upon. First, we present the theoretical frame for our analysis. Secondly, the context of study is presented along with the collected data and analytical methods for inductive coding. Finally, we present results from a thematic analysis of debriefing sessions following collaborative 360VR-mediated mentor-

ing sessions, before discussing the results of the thematic analysis against experience, thinking and action (Kjærgaard et al., 2021).

Theoretical frame

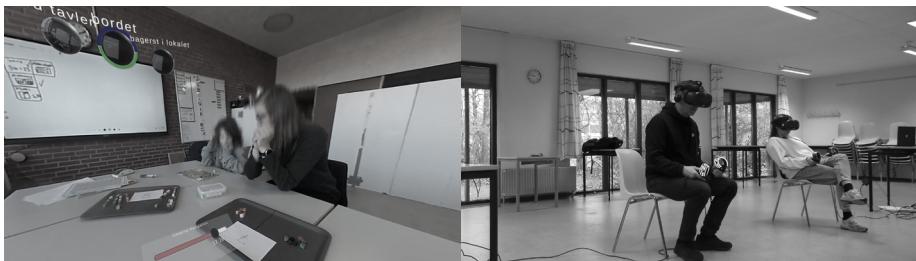
Theoretically, we view the mentoring sessions through RPL, emphasising how reflective processes are built on bridging theory and practice (Kjærgaard et al., 2021). Within RPL, reflective processes are viewed as active engagements with experiences, where reflection both takes place in-action and on-action in iterative cycles of reflection and action (Dewey, 1933; Schön, 1983). RPL aims to develop people's ability to make informed decisions and develop their practice based through three processes: *experience* – having an experience which may lead to learning, *thinking* – linking experiences to future actions and judgement through reflection and analysis, and *action* – operationalising experience and thinking by trying out and adjusting actions in practice, creating new experiences (Kjærgaard et al., 2021). RPL then aims to combine theoretical perspectives with the practice of the professions (Dau, 2024). Further, RPL emphasises that learning processes should be rooted in exploration of learners' own experiences, balancing disturbances and good examples in collaborative dialogue with teachers (Horn et al., 2021). Here we view the mentor as the primary scaffold for letting the teacher explore, reflect-on, and analyse their practice in order to build actionable syntheses that can qualify future action. In this paper we are then interested in looking at how immersive technologies can support this process of scaffolding reflective practice, both from a teacher and mentor perspective. When we apply, the concept of scaffolding we draw on Driscoll's (2005) description of scaffolding as an instructional act supporting learners in achieving tasks that would be unattainable without such assistance. Thus, scaffolding aims at enhancing learners' independent activities such as managing teaching practice. The experience-based foundation of RPL and the affiliated principles of dialogue, appropriate disruptions and collaborative inquiry supports the instructional acts (Horn, et al., 2021) and hence the scaffolding of the learning trajectories of novices' teachers.

Context of the study

This study is part of a larger design-based research (DBR) project conducted as part of the first author's doctoral research, which aims to explore how 360VR can support novice teachers' development of classroom management competencies through structured reflection with mentors (Paulsen & Davidsen, 2024, 2025a). The DBR project follows iterative cycles of (1) problem exploration, (2) design, (3) implementation, and (4) reflection leading to refinement (McKenney & Reeves, 2018). Over the course of eight intervention cycles, the design was progressively adapted based on data collected from each cycle. This paper reports on one empirical strand of this broader DBR process. Here, the focus is on teachers' and mentors' accounts from post-session debriefing conversations following collaborative 360VR-mediated mentoring sessions. While the broader DBR project integrates findings from multiple data sources to inform ongoing design, this study uses participants' accounts to uncover the perceived potentials and limitations of 360VR for scaffolding reflective practices, interpreted through the RPL lens (Kjærgaard et al., 2021). In this way, the paper contributes to both the empirical understanding of 360VR-mediated mentoring and the ongoing iterative refinement of the intervention within the larger DBR framework.

In viewing 360VR as a digitally mediated space for professional development, classroom management is understood through how the teacher's actions can facilitate a space for learning (Doyle, 2013). Classroom management is accomplished by the teacher noticing, understanding and interpreting classroom interactions and using this interpretation to adjust actions and activities as they unfold in the classroom (Doyle, 2013). The aim is then to support teachers in these shifts between noticing, understanding and interpreting – or experiencing, thinking and acting (Kjærgaard et al., 2021).

Figure 1: What participants see within VR (left) participants co-located in the 'real' world (right)



In the collaborative 360VR space, teachers can re-experience and reflect on teaching episodes with mentors in order to explore, analyse and qualify action. Mentoring sessions are built around five key steps. First, teaching is recorded using two 360-degree cameras following ethical approval from the university research ethics committee and informed written consent from all participants, including parents. After the recording, the teacher selects a number of clips that they wish to further explore within the VR mentoring sessions. Clip selection is partially guided by teachers experiencing a disturbance in their practice which they wish to zoom in on, but selected clips can also act as the good example. After the clips have been selected, teachers and mentors participate in a VR-mediated mentoring session, figure 1, where participants are jointly immersed in the clips using the free open-source software CAVA360VR² (Paulsen & Davidsen, 2025b). During the clip selection the teacher articulates a focus for each clip which is shown to participants in the VR-space before each clip. This focus is the starting point of the reflective process, giving the mentor access to the teacher's perspective when viewing and interpreting the clip. After the mentoring session, the session is debriefed with the researchers, summarising the created knowledge, with key themes and potential strategies being written down on a piece of paper with screenshots from each clip, supporting the transformation of knowledge from VR to practice. Lastly, after the session, teachers are given a couple of weeks to try out knowledge in practice before the cycle begins again. In the broader DBR project, the first author held a dual role as both researcher and designer, collaborating with mentors to iteratively refine the intervention design, while also collecting and an-

alysing data from post-session debriefings. This involvement provided direct access to participants' immediate reflections but may also have shaped the interaction during debriefing sessions and the interpretation of participants' accounts.

Data / Method

From October 2023 to June 2024, eight intervention cycles were conducted with three teacher–mentor pairings from two schools, as part of the broader DBR project described in the previous section. All VR mentoring sessions and subsequent debriefing sessions were video recorded, capturing both the participants' view inside the VR environment and their actions in the physical space. Debriefing sessions had two purposes (1) to support knowledge transformation and inquiry related to the mentoring process, and (2) to gather participants' reflections on their experiences with collaborative 360VR. The analysis focuses on this second part, which took the form of a shared dialogue between teacher (T), mentor (M), and researcher (R). The debriefing sessions analysed in this paper amount to approximately three hours of video recording. The sessions were transcribed in full and read through to become familiar with, and gain an overview of the data. Analysis followed Braun and Clarke's (2006) approach to thematic analysis as an inductive approach. No pre-defined coding framework was applied, and codes were generated directly from the data to reflect participants' own accounts. Coding was non-exclusive, allowing excerpts to be assigned multiple codes. Codes were iteratively refined, re-coded, and grouped into themes and sub-themes as patterns emerged across sessions. This process was validated collaboratively between researchers by jointly reviewing and discussing coded excerpts. Coding, grouping, and analysis were conducted in the original language (Danish) and translated for presentation in this paper. All participant names are pseudonymised.

Results: Scaffolding reflective practice

The inductive coding and grouping resulted in four overarching themes that are present across all 8 debriefing sessions: immersion, shared immersion, iterative cycles and implementation perspectives. For an overview of primary codes and sub-codes, see table 1. Number of coded instances are listed in parenthesis after each code.

Table 1: Coding of debriefing sessions

Code	Code	Code	Code
Immersion (66)	Shared immersion (52)	Cycles of action / reflection (65)	Implementation perspective (72)
<i>Sub-codes</i>	<i>Sub-codes</i>	<i>Sub-codes</i>	<i>Sub-codes</i>
VR affords immersion (24)	Being there together (7)	Facilitating transfer (22)	Four steps (52)
360-video (31)	Establishing a joint focus (10)	Outcomes of mentoring (17)	Usability / Learnability (14)
Looking at yourself (4)	Multiple perspectives (15)	Cyclic nature (21)	Organisational perspectives (3)
Jumping between viewpoints (3)	The mentor-role (12)	Involvement of colleagues (5)	Ethical perspectives (3)
Broken immersion (3)	Traditional mentoring (8)		

Within this format, it is not possible to go in depth with all the sub-themes, but sub-themes which address how the technology mediates the scaffolding of teachers' and mentors' reflective processes will be highlighted.

Theme 1: Immersion allows for re-experiencing authentic situations

The first theme deals with immersive affordances of 360-video viewed through a VR-headset, and how the technology can be used as a mediating artefact to scaffold reflective processes. One of the key affordances of video is giving access to real-world situations (Gaudin & Chaliès, 2015). Video as mentoring tool then allows for targeted mentoring (Hunskaar & Guðmundsdóttir, 2023). Teachers and mentors importantly highlighted that the omnidirectional affordance of 360-videos also allowed them to go beyond their initial focus, and view the complexity of classroom interactions in a more holistic perspective, contextualising targeted situations by seeing what else is going on in the classroom:

T: I would never have noticed how much Olivia cuts me off if I hadn't seen the clip again. M: or Mia who is waiting patiently for you to address her, before she eventually puts on her jacket and walks out. T: no, I didn't notice that at all when I was down there (in the classroom).

360-video allows for greater exploration and inquiry of the situated nature of the selected clips, allowing participants to orient themselves freely as spectators in the classroom, even jumping between different viewing angles (if multiple synced 360-videos are recorded), and allowing participants to rewind the video, and orient their view to a new area of the classroom.

Participants also highlighted the immersive affordance of the VR-mediation, and how it allows them to feel completely present in the classroom, both for the teacher who is re-experiencing their own practice, and the mentor who is experiencing the situation for the first time:

M: when the clip began, I completely forgot my surroundings, I forgot everything. I was inside the classroom. T: I also forgot we were actually sitting here (in the empty room in the physical space). I imagined that we were in the classroom, and that we're pausing reality.

The two quotes presented in this theme, show that the omnidirectional affordance of 360-video and the immersive affordance of VR allows participants to experience, re-experience and reflect on real-world scenarios in an embodied way, which allows for reflective dialogues which are deeply rooted in practice. While some teachers initially described the act of feeling present in the recorded classroom while viewing their own teaching as "slightly unsettling", they also felt that they became aware of their teaching in a way they hadn't experienced before, which greatly outweighed the initial feeling of weirdness. Throughout the iterative cycles, it became clear that the camera perspective was important to this feeling, as a close distance between the camera and teacher, made the teacher appear larger in the 360-video, which felt unnatural when re-watching the clips.

Theme 2: Shared immersion affords multiple perspectives

The second theme deals with shared immersion, going beyond the first theme by exploring how the pedagogical arrangement of being there together, can further scaffold the reflective process. One of the key advantages that both teachers and mentors highlight when talking about being immersed together, is that they get to explore different perspectives. Teachers emphasise that the mentor being able to highlight specific parts of the video helps them re-evaluate their own initial interpretation of what is happening in the clip, what it means for their teaching practice, and how they can transform their reflective dialogue into action:

T: if I came to talk to you about something that had just happened during my teaching, then I would have only been able to show you my version of it. I could only say what I interpreted, and you could only give feedback on that interpretation. M: I completely agree.

T: then you couldn't have done as you do now, identifying what is also happening which influences the interpretation. M: completely agree, here you get a fellow interpreter for looking at what is happening.

Mentors emphasised that this format allows them to more precisely scaffold reflective processes, as they are able to ask more relevant questions when they get to shape their own interpretation of the situation, rather than only relying on the teachers' interpretations.

While the large potential for exploration of situations is emphasised as positive, it also necessitates that participants establish a joint focus in order to structure the reflective dialogue. Both mentors participating in the project highlighted that they had to "keep a lid on themselves", as they quickly identified multiple relevant foci when watching the clip together with the teacher. A key part in establishing this joint focus is through the built-in laser pointer in CAVA360VR² (Paulsen & Davidsen, 2025b), which allowed participants to virtually point and highlight where they are looking, making the other participant aware:

T: I definitely felt we were there together. Especially because I could say "no, the group over here" and then point with the laser. And you can't see me turning around in the real world, but you could follow

the laser. M: yes, we had aligned our way of looking by the end. T: yes, so the laser is good.

While the feeling of being there together when revisiting previous practices seems to be what allows for the reflective dialogues to go from exploring and analysing specific situations to inferring more general statements about the situation that the participants can use to formulate actionable strategies (Paulsen & Davidsen, 2024), the teachers also emphasised that this kind of mentoring requires trust between teacher and mentor, as the immersive affordance also makes it a very personal kind of mentoring. Teachers also highlighted that they would rather get feedback on their general actions as a teacher, e.g., classroom management, rather than getting feedback on whether they have chosen a good task in a subject. This is in alignment with Pirker & Dengel (2021) conceptualisation of 360VR as a space that is ideal for changing attitudes and values, rather than purely producing procedural knowledge.

Theme 3: Cycles of action and reflection

The third theme goes beyond the collaborative 360VR space and explores how action and reflection are tied together in cycles of trying out knowledge in practice and then reflecting on-action (Schön, 1983) in the VR-space. While most programmed VR applications for training classroom management allow teachers to receive direct feedback on their change in strategies when interacting with virtual classrooms, e.g., Huang et al. (2023), 360VR creates a temporal gap between reflection and trying out in the classroom. In order to make the reflective dialogues actionable in practice, mentors emphasised the need to abstract the specific situation to a more general statement, that could be the driving force behind trying out changes in the classroom:

M: i think that we really quickly establish a think-aloud space, where we tie the specific to the abstract. The abstract are problem statements that go across situations. There is no use in spending an hour solving a problem that isn't a problem in most of the hours we are teaching. We are only interested in the overall problem, because that can follow through to other situations and make it better for you and the children.

In order to support the transformation of knowledge, these statements were written down on a piece of paper during the first part of the debriefing sessions, allowing knowledge to be reified. Teachers all addressed that the cyclic nature of the format was what allowed them to become more reflective about their practice. The second mentoring session allowed the teachers to select clips where they had tried out different actions / strategies based on the reflective dialogue from the first mentoring session. Being able to see the difference between the clips from the first and second session was often addressed:

T: It was really fun to see the difference from the first time we recorded. They are really productive during my classes now. It is getting better and better.

In general, it was noted by the teachers, that the scaffolded reflection during mentoring sessions also led to them becoming more observant and reflective during their everyday practices:

T: I realise that of course it also has a lot to do with getting to know the pupils better and that I've been here longer. But I think there are so many focus points I've been made aware of in these VR sessions which I've just been able to work so intensely with in my teaching.

This was also noted during the clip selection sessions, where less researcher facilitation was needed during the second and third intervention cycles. This shows the importance of designing mentoring activities that involve active cycles of reflection and action, rather than just focusing on one-off sessions.

Theme 4: Implementation perspectives

The fourth theme takes a macro-perspective on the mentoring process, dealing with implementation perspectives of the current state of collaborative 360VR for scaffolding reflective practices.

While most of utterances coded under implementation perspectives, especially the ones coded under 'format', concern themselves with the iteration done to the format throughout the intervention cycles, some of them are of a more general character. Throughout the analysis, immersion has been highlighted as one the key scaffolding mechanisms

for supporting the reflective dialogue between teacher and mentor. One teacher mentor pairing however changed up their way of using the technology after their first cycle. In order to contextualise the use, we briefly refer to previous work within the project, where the reflective processes during the sessions have been modelled showing that participants move between three primary phases, analysis, abstraction and actionability (Paulsen & Davidsen, 2024). During the first cycle the teacher mentor pairing were mainly centred on exploring and analysing which led to a lot of warping between camera positions and laser use. The selected clips in the second and third sessions were dominantly follow-up clips, which led to less analysis and more abstraction. In this shift, participants switched from being fully immersed during the entirety of the session, to embracing a more hybrid format, taking the glasses on and off depending on the phase of the reflective process. If analysis of actions was required, they re-immersed themselves to do so. If they had already agreed on the theme of the clip, they preferred to jointly reflect in the physical space, emphasising the human connection of being able to look each other in the eyes. This stands in contrast to the other two teacher-mentor pairs, who explicitly stated that they preferred keeping the entire reflective process within the VR-mediated space, stating that when the VR-glasses are off, “the magic is gone”. This divergence suggests the need to further explore different ways of working with 360VR as a mediating tool for scaffolding mentoring.

Another important point regarding the format concerns the temporal aspect of the cycles between reflection and action. It became clear that there had to be a relatively short time span between recording-selecting-mentoring in order for teachers to be able to effectively recall not just the recorded actions, but also how they felt during the clips. The timespan between mentoring and recording should however be extended, preferably around two weeks, for being able to try out different ways of transforming knowledge into action.

Regarding the general usability and learnability of the hard- and software, a general theme was that it was a bit tricky at first. None of the participants had prior VR-experiences before participating in the project but agreed that the technology quickly became useable to a point where it did not in any way compromise the reflective process.

While ethical perspectives were briefly addressed during some of the debriefing sessions, none of the participants viewed it as a major concern,

nor addressed that they felt it was a concern for their pupils. Throughout the project the ethical dimension was highly emphasised, and the researcher initially met with the classes that were going to be recorded, explaining the recording equipment and answering questions.

Discussion

This study set out to examine how teachers' and mentors' experiences of collaborative 360VR mediated mentoring inform an understanding of the technology mediated activity's potentials and limitations for scaffolding reflective practices. In the introduction, we situated this aim within the framework of RPL, conceptualising reflection as an interplay between experience, thinking, and action (Kjærgaard et al., 2021). In the following discussion, we use the RPL concepts of experience, thinking, and action as a lens to discuss the four themes and consider 360VR's potentials and limitations in scaffolding reflective practice.

Experience

In RPL, experience is seen as a personal experience which may lead to learning (Kjærgaard et al., 2021). Through the first two themes it becomes clear that 360VR hold great potential for mediating experiences in a more bodily manner than traditional video. Participants feel that they are experiencing the situations with their bodies rather than just watching them through their eyes. While the immersive affordances of the mediation makes the participants feel that they are experiencing the interactions firsthand, what they are actually experiencing is more of a mediated secondary experience. The teacher has already experienced these interactions, but through a different set of eyes (her own original eyes), where the teacher now gets to re-experience the interactions through the camera's 'eyes'. While 360VR allows participants to feel like they're experiencing first hand classroom interaction, the camera is important to keep in mind, as video recordings are never objective, but only capture a version of a situation as it unfolds (Heath et al., 2010). While 360-degree video allows for capturing more context than a traditional 2D camera, we're still not capturing all of the aspects of experiencing that we might capture through our own bodies, such as smell or the general atmosphere in and around the classroom.

Another part of experience is highlighted through the second theme. The collaborative 360VR mediation allows for experiences to become shared experiences, as learners get access to the same set of mediating eyes (the camera). While the teacher and mentor both construct their own observations and interpretations based on their differing professional vision (Goodwin, 1994), they do so from the same mediated point-of view, as they are both watching through the same camera lens. In a typical observation scenario, the teacher would observe from one vantage point (typically the front of the class), with the mentor observing from the back of the class. Instead, 360VR allows for a new way of experiencing, where learners look at the same situations from the same point-of-view, but notice and observe different aspects. Here, the 360VR mediation further allows for different orientations within this point-of-view. Where 2D cameras are locked in their orientation, 360VR allows learners to look at different parts of the classroom while standing in the same place, potentially leading to different interpretations of the observed classroom situations.

A potential limitation with this way of experiencing classroom situations is when immersion gets broken, making learners feel less present in the mediated recordings. One cause of this can be cybersickness, a known hinderance with VR (Chang et al., 2020). While far from all learners will experience cybersickness, it is important to have in mind when designing and developing pedagogical activities which involve VR, as it may comprise the learners' ability to experience situations. In our case, a minor case of discomfort was eliminated after participants were moved from standing up to sitting down. Participants were sat down on chairs which still allowed them to rotate in order to experience the spatial affordance of the 360-degree videos. If any form of cybersickness should still occur, the utilised software also allows learners to participate through a traditional computer screen (using a computer mouse for looking around) ensuring that cybersickness doesn't exclude any learners from participating in 360VR activities.

Thinking

In RPL, thinking is what links experiences to future actions and judgement (Kjærgaard et al., 2021). When it comes to thinking, 360VR bridges experience and thinking, both on an individual and shared basis. For the teacher, the re-mediation of the classroom allows for seeing more

than in-action (Schön, 1983). The 360VR mediation allows for pausing the classroom, looking around, and rewinding – things which are not possible when reflection occurs in-action. In this sense, the mediation blurs the boundary between reflection in- and on-action, as the teacher re-enters a recorded version of their classroom in order to expand on their reflections in-action while reflecting on-action. This allows for more contextualised reflection, as the teacher can observe situations through different lenses by looking at different areas of the class, leading to a better understanding of the classroom in its entirety. This aligns with the more ecological view of classroom management, where observing and interpreting classroom interactions is the key to adjusting actions (Doyle, 2013).

In RPL, thinking is scaffolded through dialogue, giving others something to think about, and ways of thinking (Kjærgaard et al., 2021). As a collaborative activity, the reflective dialogues allow for thinking together about shared experiences – both mediating something to think about (immersion in a 360-degree video), and a way of thinking about it (shared immersion). The ability to observe from the same point-of-view allows for more nuanced thinking, as different perspectives are exchanged and challenged in a collaborative manner.

Action

Action in RPL is the operationalisation of linking experience and thinking – trying out and adjusting actions in practice, creating new experiences (Kjærgaard et al., 2021). An important consideration when it comes to the acting part of RPL, is that 360VR creates a temporal gap between reflection and action. Where learners in programmed VR environments can interact directly with the 3D-generated worlds to try out different scenarios (Wang & Li, 2024), 360VR promotes social interaction over interactivity. While learners can't directly try out knowledge within 360VR, they can reason about possible future actions together with others, qualifying future action. In this view, knowledge transformation can be seen as situated (Dohn & Markauskaite, 2019), acknowledging that knowledge constructed within VR is different from the knowledge applied in the classroom, meaning that knowledge is not transferred, but transformed. Through this lens, it is important to design and develop supportive measures that can scaffold this transformation process, ensuring that constructed knowledge is not isolated within the

VR space. In this case we have done so through storyboards, where a screenshot from each selected teaching episode is printed together with a blank text field on an A4 paper sheet. After teachers and mentors have concluded the 360VR-mediated mentoring, they fill out the paper in the shared physical space, allowing them to ensure that their perspectives are aligned when noting down the theme of the clip and the planned points of action. The video-mediation allows for risk-free reflection, reasoning and imaginative experimenting. While teachers and mentors can't directly experiment with alternative actions within 360VR, they can imaginatively reason about what actions the teachers could take, and how they would shape the classroom interactions. This gives the teacher the opportunity to imaginatively judge their actions, allowing for pre-adjustment of actions before trying out knowledge in-action, without the risk of interfering with the classroom practice.

Lastly, it is important to highlight that the thematic analysis also shows that the cyclical nature serves as a link between experiencing, thinking and acting. While teachers also benefited from the first VR-sessions, they saw the greatest benefit from their second VR-sessions, where they could link their experiencing and thinking back to the acting, they performed in the classroom based on the thinking done in the first VR-session. If possible, iterative cycles should be implemented in mentoring activities, ensuring an iterative cycle between experiencing, thinking, and acting.

Conclusion

Throughout this paper we have explored the potential and limitations of collaborative 360VR as a mediating tool for scaffolding reflective processes. The strongest potential lies in 360VR mediating both access to recorded situations from practice and mediating a tool-based reflective dialogue between novice teachers and mentors, allowing for different perspectives to emerge and be discussed. The thematic analysis of debriefing sessions showed this through three key themes (1) The immersive affordance of 360VR allows for re-experiencing authentic situations from real life practices. (2) Shared immersion allows for multiple perspectives, leading to a better understanding of classroom interactions, and their implications for the teaching practice. (3) cycles of action and reflection allow for linking experience, thinking, and action by working with themes in VR, trying out knowledge in practice, and then re-vis-

iting themes through another cycle of VR-mediated mentoring. The fourth theme of the thematic analysis and the subsequent discussion also highlights that implementation issues and cybersickness are currently seen as potential hinderances for large-scale use of this approach. Future research should explore different ways of working with this method and consider how the intervention design can be designed to minimise facilitator intervention, making it easier for schools to implement the method in their induction periods. The preliminary results surrounding the approach also show great promise in adapting 360 VR-mediated in other professions, where reflection is also a key component to engaging with complex real-world practices.

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Simulation-based e-communication as a reflective learning tool for nursing students

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Abstract

Simulation-based training in e-communication offers nursing students a valuable opportunity to develop critical competencies for contemporary healthcare practice. At the University College of Northern Denmark (UCN), this training incorporates realistic scenarios such as telemedicine consultations and virtual interprofessional collaboration, enabling students to engage in experiential, reflective learning. Grounded in a pedagogical approach emphasizing iterative cycles of action, reflection, and feedback, the training supports the development of effective digital communication strategies. Structured debriefing sessions foster self-assessment, empathy, and professional accountability, deepening students' understanding of their roles in virtual care settings.

This qualitative study explores students' experiences of e-communication simulation through open-ended survey responses, analysed using Braun and Clarke's thematic analysis. Five overarching themes emerged: (1) navigating digital communication and relationship-building; (2) simulation as a catalyst for experiential learning; (3) technological uncertainty as authentic disturbance; (4) the role of preparation and psychological safety; and (5) role exploration and interprofessional perspective-taking. These themes reflect how the simulations fostered adaptive communication, critical thinking, and collaboration. Moreover, the design effectively operationalized pedagogical principles of learning through challenge and exploration, encouraging students to navigate uncertainty and construct knowledge through interaction.

Findings underscore the value of simulation-based e-communication training in preparing nursing students for the complexities of digital healthcare. By promoting reflection, adaptability, and interprofessional

awareness, such training offers a robust framework for cultivating essential competencies in virtual care environments.

Keywords

Reflective practice-based learning, nursing students, simulation-based e-communication, evaluation, interdisciplinary consultation

Background

Simulation-Based Learning (SBL) has gained widespread acceptance in nursing and healthcare education due to its ability to recreate realistic clinical situations in a safe, structured environment. This approach allows learners to apply theoretical knowledge and develop critical thinking without the risk of harm to patients (Chernikova et al., 2020). Particularly in nursing—where clinical competence, judgement, and interpersonal communication are core to effective practice—SBL offers opportunities for experiential learning that enhance both immediate skill acquisition and long-term retention (Steadman et al., 2006). The growing use of simulation reflects a broader pedagogical shift towards active and reflective learning strategies that centre the student experience.

One of the key strengths of SBL lies in its capacity to support reflective practice—a process in which learners critically examine their actions, decisions, and emotional responses to enhance professional development. In nursing education, reflective practice is widely recognised for fostering deeper learning, improved clinical reasoning, empathy, and professional accountability. When paired with structured debriefing, simulations become more than technical exercises; they serve as reflective spaces where students analyse communication strategies, assess outcomes, and consider how their actions align with professional standards (Alharbi et al., 2024).

While traditional SBL has focused largely on high-stakes clinical procedures such as resuscitation or managing patient deterioration (Mcgaghie et al., 2014), there is a growing need to apply simulation-based approaches to communication training. Effective communication is a fundamental skill for nurses, with direct implications for patient safety, interprofessional collaboration, and quality of care (Chien et al., 2024). The Situation, Back-ground, Assessment, Recommendation (SBAR) framework has become a widely used structured communication tool

in both education and practice (Shahid & Thomas, 2018), yet nursing students often lack active, reflective opportunities to practice these skills in clinical placements, where their roles may be observational and passive (Li et al., 2019). Simulation can fill this gap by providing repeated, immersive communication experiences coupled with reflective feedback.

More recently, the digital transformation of healthcare—through telemedicine, electronic documentation, and virtual care platforms—has expanded the communication landscape, making e-communication an essential competency for nurses. However, many traditional communication training programs do not adequately prepare students for the challenges of interacting through digital media, where indications may be reduced, and the complexity of information exchange heightened. This has created a critical pedagogical need for simulation-based e-communication training, which allows students to rehearse digital interactions in realistic, scenario-based environments (Alharbi et al., 2024; Yun et al., 2023).

Simulation-based e-communication training introduces students to common digital communication tasks such as virtual consultations, electronic patient handovers, and interprofessional email or messaging exchanges. When integrated with reflective learning practices—particularly through structured debriefings—these simulations enable students to critically analyse their digital interactions, identify strengths and gaps, and continuously refine their approach. Reflective debriefing facilitates not only technical skill improvement but also development of empathy, situational awareness, and accountability—essential attributes in digitally mediated care (Husebø et al., 2024; Lervik et al., 2025). Despite the theoretical and pedagogical promise of simulation-based e-communication training, its effectiveness as a reflective learning tool remains underexplored in nursing education. Previous research has shown that incorporating structured communication models like SBAR into simulation can improve communication clarity and learner confidence (Noh & Park, 2022; Roso-Bas et al., 2020). However, results across studies remain inconsistent due to variations in program design, fidelity, and assessment methods (Müller et al., 2018; Oner et al., 2018). Furthermore, few studies have examined how simulation-based communication training—particularly in digital formats—supports students' reflective capacities and long-term professional development. This study seeks to address these gaps by presenting an evaluation of a simulation-based e-communic-

tion training program implemented at the University College of Northern Den-mark (UCN).

Aim

The aim of this study is to assess the efficacy of simulation-based e-communication training as a reflective learning tool for nursing students based on student evaluations. Specifically, the research seeks to:

1. Investigate how simulation-based training enhances nursing students' competence and confidence in digital communication.
2. Examine the role of reflective practice in improving decision-making, empathy, and professional ac-countability in e-communication settings.
3. Analyse the impact of structured debriefing sessions on students' ability to critically assess and refine their communication strategies.

By addressing these objectives, this study contributes to the ongoing dis-course on innovative nursing education strategies, demonstrating how simulation-based e-communication can prepare students for the evolv-ing demands of the digital healthcare landscape.

Methods

The e-simulation course

The e-simulation course combined theoretical knowledge with practical training to enhance communication, individualised care, and clinical application. The course was implemented as part of the fourth-semes-ter technology curriculum in the nursing education program at UCN. It consisted of five lessons and was delivered across four different student cohorts during the autumn of 2024 and the spring of 2025. The course was developed by the authors of this article, guided by principles of re-reflective practice-based learning (RPL) (Horn et al., 2020).

Participants

A total of 89 nursing students participated in the e-simulation course. Participants were divided into small groups of 4 to 7 individuals to ensure an interactive and manageable training environment. Inclusion criteria required students to have prior coursework in communication and pedagogical theory and presentation of a technological framework (including introduction to telemedicine) to foster understanding and critical reflection. Further, the students have some clinical experience and previous experience with using technological solutions like for instance telemedicine. Before participation, students were required to review key concepts, including communication strategies, patientcentred care etc.

Structure and setting of the e-simulation course

The teaching activities were centred around a simulated telemedicine conference, designed to train students in professional, empathetic, and effective communication using digital platforms. The training included both theoretical and practical components, with an emphasis on ethical, legal, and technical aspects of telemedicine. The core simulation involved two distinct scenarios. Students were divided into groups, each working with either **scenario 1** or **scenario 2**:

Scenario 1 focused on a one-on-one video consultation with a patient diagnosed with chronic obstructive pulmonary disease (COPD) and hypertension. The aim was to support the patient in using home monitoring equipment and to help her and her relative manage their anxiety related to worsening symptoms. The simulation emphasized empathic communication, patient guidance, and clinical decision-making in a virtual environment.

Scenario 2 involved an interdisciplinary telemedical consultation with a patient managing type 2 diabetes and chronic kidney disease (CKD). Students collaborated with a physician and a dietitian to develop a coordinated care plan, integrating diverse professional perspectives in a virtual setting. The focus was on nursing care, clinical coordination, communication strategies, and patient engagement in a digital context. Each simulation was followed by structured feedback and reflection sessions, allowing students to critically assess their communication, technological handling, and interprofessional collaboration skills. These sessions aimed to enhance students' competencies in navigating remote care settings and using telemedicine tools effectively.

Steps in the e-simulation course (the simulation procedure)

Step 1: Case (scenario) development

Realistic patient cases were developed, focusing on scenarios involving individuals with COPD or CKD. The cases were tailored to reflect real-world virtual clinical settings and designed to challenge students' ability to apply e-communication strategies effectively. Each case outlined the patient's background, symptoms, and specific communication challenges.

Step 2: Learning objectives

The simulation training aimed to enhance students' ability to:

- Apply effective communication techniques with patient, their families and professionals.
- Identify and accommodate challenges in developing a relation and making nursing patient-centred care in digital context.
- Utilize a patient-centred approach in clinical interactions.
- Reflect on and improve their communication strategies.

Step 3: Simulation setup

The simulations were conducted in a controlled setting designed to replicate a virtual clinical environment. Students had access to audiovisual equipment (TEAMS and internet connection) for real-time observation. In scenario 1, the nurse and observers (representing the clinical environment) were placed in one room, and the patient and her relative (representing the patient's home) were placed in another room. In scenario 2, the nurse and observers were placed in one room, while the patient and each member of the interdisciplinary team were placed in separate rooms. The training sessions were structured to include role-playing exercises, where each group member assumed one of the following roles:

- **Nurse/healthcare professional** – Responsible for leading the interaction and applying communication strategies.
- **Patient** – Portrayed a person with COPD or CKD, requiring careful communication.
- **Relative** – Represented an anxious family member assisting with the conversation.

- **Observers (1 to 4 per group)** – Focused on specific aspects of communication, such as verbal and non-verbal cues (use of professional jargon), didactic approach, and patient-centred approach.

Step 4: Briefing

Prior to simulation execution, students participated in a prebriefing session to familiarize themselves with the case details, learning objectives, and simulation procedures. Instructions were provided regarding their roles, expected behaviours, and evaluation criteria. These criteria included ensuring that the patient understood what was being communicated, using language that was accessible to both the patient and the relative, and avoiding medical jargon. It was also emphasized that, in their role as nurses, students could beneficially apply a communication model such as the Calgary-Cambridge Guide (Kurtz & Silverman, 1996), which they had previously been introduced to during their fourth-semester coursework.

Step 5: Simulation execution

Each group conducted a full role-play session, simulating a real patient encounter or interdisciplinary interactions. The interactions were designed to mimic authentic virtual clinical settings, requiring students to apply theoretical knowledge in practice. Students were encouraged to engage naturally while maintaining a professional and patient-centred approach. The sessions were observed live by instructors.

Step 6: Debriefing and reflection

Immediately following the simulation, a structured debriefing session was conducted. Students reflected on their performance, discussing both strengths and areas for improvement. The debriefing followed a guided discussion format based on the PEARLS Healthcare Debriefing Tool (Eppich & Cheng, 2015). In the debriefing, both students and the instructor focused on the instructor's facilitating role, drawing inspiration from Ib Ravn's work on facilitation (Ravn, 2023). The instructor's role was to explore how students experienced being assigned different roles, such as nurse, patient, relative, or doctor. Additionally, the instructor asked students with observer roles about their observations, particular-

ly regarding the relationship and communication between the nurse, the patient, and the relative.

The debriefing was structured around the following elements:

Reactions: Exploring feelings by asking questions such as, "How did you feel in your role as the nurse?", "How did you feel as the patient?", "How did you feel as the relative?", "How did you feel as the doctor?", and "What did you observe in terms of the relationship and communication between the nurse, patient, and relative?"

Description: Clarifying the facts and developing a shared understanding of the case (e.g., "Can you please share a short summary of the case?")

Analysis: Exploring various domains of performance. Students were encouraged to self-assess and reflect on their own performance. The instructor used focused facilitation to highlight key aspects, address any knowledge gaps as they emerged, and provide directive feedback when necessary.

Application/Summary: Identifying key "take-aways" from the discussion (e.g., "What are some take-aways for our future clinical practice?"). The instructor also summarized the key learning points from the case.

Application of RPL principles in the e-simulation course

The learning environment where knowledge was developed has been shaped by the six core principles of RPL (Horn et al., 2020):

1. The students' own experiences are incorporated into teaching and learning activities.
2. Teaching and learning activities are designed to include appropriate disturbances.
3. Teaching and learning activities are organized as exploration.
4. The content of teaching and learning activities is based on exemplary models.
5. Lecturers and students collaborate on learning processes.
6. Lecturers and students create space for dialogue.

The simulation-based telemedicine training for nursing students was structured around three of the core principles of RPL: (2) designing learning activities with appropriate disturbances, (3) organizing learning as exploration, and (4) basing learning activities on exemplary models. These principles were strategically embedded into both the theoretical and practical components of the training, which emphasized ethical, legal, and technical considerations in telemedicine, alongside professional, empathetic, and effective communication in digital healthcare environments.

Principle 2: Teaching and learning activities are designed to include appropriate disturbances

To simulate the complexity and unpredictability of real-life telemedicine practice, each scenario included deliberate challenges that required students to engage in critical thinking and adaptive communication strategies. In scenario 1, the emotional distress and technological inexperience of the patient with COPD and hypertension created a realistic tension, prompting students to navigate both clinical support and empathetic reassurance in a one-on-one digital setting. In scenario 2, the interdisciplinary nature of the consultation introduced potential for role ambiguity and communication misalignment, compelling students to negotiate professional boundaries and collaboratively construct a care plan in a dynamic virtual environment.

Principle 3: Teaching and learning activities are organized as exploration

Students were encouraged to actively engage with each scenario through a problem-based learning approach, where they assumed responsibility for managing evolving patient situations. In both scenarios, students were given opportunities to explore digital communication tools, adapt clinical protocols to virtual contexts, and reflect on their decisions through post-simulation debriefings. These exploratory tasks enabled students to make autonomous decisions, receive feedback, and iteratively refine their approach to digital care delivery.

Principle 4: The content of teaching and learning activities is based on exemplary models

All simulated interactions were grounded in current best practices and evidence-based guidelines for telemedicine, including communication frameworks for digital health, interprofessional collaboration models, and clinical protocols for managing chronic diseases remotely. Prior to the simulations, students received preparatory instruction based on these models, which served as reference points during practice. Instructors reinforced these standards during feedback sessions, linking student performance to established benchmarks in tele-health professionalism and patient-centred communication.

By integrating these principles into the simulation design, the training promoted reflective, situated learning that prepared students for the complexities of contemporary digital healthcare environments.

Study design (assessment of the efficacy of simulation-based e-communication)

This study employed a simulation-based training approach to enhance communication skills among students. The simulations were designed to provide students with a structured, realistic learning experience that integrated theoretical knowledge with practical application. The study followed a stepwise methodology, including case (scenario) development, participant briefing, scenario execution, and structured debriefing.

Data collection and analysis

Qualitative data were collected from nursing student reflections through an open-ended qualitative survey. A post-simulation questionnaire assessed nursing student confidence and perceived competency in clinical communication before and after the training. Thematic analysis, focusing on key communication themes, barriers, and improvement strategies. Based on Clark and Braun's thematic analysis, the following six steps were followed. (1) Transcriptions were read and re-read to familiarise with the data and note initial ideas; (2) Codes were generated from these ideas, and relevant text phrases were collected for each code; (3) Codes were sorted into potential themes; (4) Themes were reviewed to ensure they worked with the coded extracts and the entire data set, creating a thematic map; (5) Themes were defined and named, refining the

specifics and generating clear definitions and names; (6) Results were presented (Braun & Clarke, 2022).

Ethical considerations

Informed consent was obtained from all participants, and anonymity was ensured in data reporting. The simulation was designed to minimize psychological stress, and participants were given the option to withdraw at any stage.

Results

Out of 89 possible respondents, 71 (79.8 %) completed the qualitative survey.

The thematic analysis of qualitative reflections and survey responses revealed five overarching themes that reflect nursing students' experiences and learning outcomes from participating in simulation-based training in e-communication. The five overarching themes: (1) navigating digital communication and relationship-building; (2) simulation as a catalyst for experiential learning; (3) technological uncertainty as authentic disturbance; (4) the role of preparation and psychological safety; and (5) role exploration and interprofessional perspective-taking. The results illustrate how the simulation design supported the development of digital communication competencies, fostered reflective practice, and operationalized key pedagogical principles—particularly those aimed at promoting learning through challenge (principle 2) and exploration (principle 3).

1. Navigating digital communication and relationship-building

A central theme across responses was the challenge of forming and maintaining therapeutic relationships in a digital environment. Students reported that the lack of physical presence, limited access to non-verbal cues, and the potential for distractions demanded a heightened awareness of how they communicated. This aligns with Martinsen's emphasis on presence and relational attention, which are challenged yet not impossible in digital interactions (Martinsen, 1994). Students emphasized a need for increased intentionality in their speech (clear articulation, summarizing key points), the use of explicit summarization, and the ver-

ification of mutual under-standing (and verifying patient understanding to maintain mutual engagement)—techniques that mirror Bonnevie's articulation of empathy as an active, situated, and professional capacity (Bonnevie, 2023). This theme strongly aligns with principle 2, as students were placed in situations where familiar communication strategies were insufficient, requiring them to adapt and develop new techniques for digital rapport-building. The simulation thus functioned as a *designed disturbance*, shifting the context and prompting critical reflection on what constitutes effective communication in a virtual setting.

"I realized how much I rely on nods, facial expressions, and body language—over video, I had to be much more deliberate with my words and tone."

2. Simulation as a catalyst for experiential learning

Students described the simulations as valuable because they provided a safe and structured context for applying theoretical knowledge to realistic virtual clinical scenarios. Many noted that while the exercise was initially anxiety-provoking—particularly when performed in front of peers—it ultimately offered a space where errors could be made without consequences, and learning could occur through trial, error, and guided reflection. While initial discomfort was common—especially under peer observation—this unease fostered learning through what Dau & Nielsby describe as 'reflective competence', where professional identity is shaped in dia-logical and experiential contexts (Dau & Nielsby, 2018). The structured unpredictability of the simulations is an example of principle 2 in action. The complexity of the tasks, combined with role-playing and time constraints, introduced productive discomfort, which students had to navigate. This also created conditions for principle 3, as students actively constructed meaning through action, feedback, and peer discussion. The simulated nature of the environment allowed for what Martinsen refers to as "the room for hesitation", where nurses can pause, reflect, and choose ethically grounded actions without fear of harming real patients (Martinsen, 1994).

“It was uncomfortable at first, but the moment something didn’t go as planned, we had to figure it out together—and that’s where the learning really happened.”

3. Technological uncertainty as authentic disturbance

Technology played a dual role in the simulation: it was both the medium of communication and a source of disruption. Students encountered issues such as unstable internet connections, delayed audio, and unfamiliar interfaces, which sometimes interrupted the flow of the session. However, these experiences were not seen purely as obstacles; rather, many students viewed them as realistic challenges that reflect the complexities of telehealth in actual practice. These scenarios exemplify Dau & Nielsby's concept of professional resilience and adaptive leadership, where future nurses must navigate ambiguity and maintain composure under technological strain (Dau & Nielsby, 2018). These moments required professional judgment in Martinsen's sense—not just technical skill, but also the moral and relational tact needed to maintain the integrity of the patient encounter under imperfect conditions. Simultaneously, students were prompted to engage empathically with the patient experience of disconnection or misunderstanding, thus drawing on Bonnevie's notion of empathy as practical, cognitive, and emotional attunement (Bonnevie, 2023; Martinsen, 1994). This theme clearly reflects principle 2, as the technological issues served as authentic disturbances embedded in the simulation design. Rather than being controlled out of the learning experience, these challenges encouraged students to think critically, adjust their approaches, and develop contingency strategies—core skills in professional practice. At the same time, principle 3 was operationalized as students explored how to maintain structure and connection under less-than-ideal conditions.

“When the audio started glitching, we had to stop and re-centre the conversation. It taught me how to calmly manage unexpected problems during a patient call.”

4. The role of preparation and psychological safety

Students' engagement with the simulation was highly influenced by the degree of preparation, clarity of role assignments, and sense of psychological safety within their groups. When students felt prepared and supported, they reported greater willingness to participate actively. Conversely, lack of guidance, last-minute role allocation, or unclear expectations led to uncertainty and performance anxiety. This aligns with Dau & Nielsby's emphasis on pedagogical scaffolding as a prerequisite for enabling reflective practice (Dau & Nielsby, 2018). Too much ambiguity, however, could result in counterproductive anxiety, suggesting the need for calibrated challenge. The role of psychological safety echoes Martinsen's ethical insistence on care as foundational to both patient and peer relationships - a care that includes the space to falter, reflect, and grow. Peer collaboration and joint problem-solving, when supported, created spaces of shared professional formation, enabling students to discover solutions rather than merely execute predetermined plans (Martinsen, 1994). These are key aspects of principle 3, which centres learning as co-constructed and emergent.

"We agreed in the group to spend a few extra minutes preparing for the consultation based on each person's role focus, which created a sense of security."

"The assignment of roles was quite fine as we were in a safe group, but it can also be challenging for some if they do not fully trust their own abilities."

5. Role exploration and interdisciplinary perspective-taking

Many students reflected on the value of engaging in unfamiliar professional roles, such as playing a physician, dietitian, or patient. This allowed them to experience consultations from different vantage points, deepening their understanding of team-based care and communication responsibilities across roles. Students expressed that stepping into these new perspectives was initially uncomfortable but ultimately fostered empathy and insight. This role-shifting facilitated empathic insight, resonating deeply with Bonnevie's argument that empathy is cultivated through perspective-taking and active listening. Playing the patient role

revealed the communicative burdens patients face and underscored the importance of clarity and compassion in healthcare communication (Bonnevie, 2023). This experience also activated Martinsen's idea of ethical imagination, whereby professionals must envision the patient's perspective and act accordingly (Martinsen, 1994). Role-playing not only disrupted existing professional assumptions (principle 2) but also expanded students' understanding of healthcare as a collaborative, dialogic space (principle 3). These simulations supported the development of ethical and clinical judgement, moving students toward becoming reflexive practitioners capable of nuanced relational care.

Here, principle 2 was activated by introducing cognitive dissonance — students had to navigate a role they were not formally trained for, prompting reflection and adaptation. Simultaneously, principle 3 was clearly at play: students were not passively receiving information but actively constructing understanding through role-taking, collaboration, and reflective dialogue.

“Being the patient was surprisingly difficult. I now understand how confusing it can be when professionals use too much jargon.”

Discussion

The findings of this study highlight the significant role of simulation-based e-communication training in enhancing nursing students' digital communication skills. By integrating reflective practice into these simulations, the study demonstrates how this approach not only improves nursing students' competence and confidence but also helps them navigate the complexities of virtual care settings. The study showed that the inclusion of disturbances, such as technological challenges and role ambiguity, created realistic scenarios that required nursing students to adapt and develop effective communication strategies.

A key aspect of this simulation-based training was the use of PEARLS (Eppich & Cheng, 2015); a structured debriefing tool aimed at improving clinical practice. This tool proved essential in helping instructors tailor debriefing sessions to meet specific learning objectives, such as skills enhancement and team training. During these debriefing sessions, students had the opportunity to critically evaluate their communication strategies in a safe and supportive environment. This process not only en-

hanced their communication skills but also fostered a culture of continuous learning and self-improvement. Creating a psychologically safe environment for students is another crucial challenge in simulation-based training. Psychological safety—where students feel comfortable speaking up and taking risks without fear of ridicule or embarrassment—is essential for effective learning. Instructors must foster this environment through pre-briefing, setting clear expectations, and cultivating mutual respect and trust. Despite its importance, establishing psychological safety can be difficult due to factors such as pre-existing team dynamics, learner characteristics, and organizational culture. Nonetheless, maintaining this safe environment is vital for ensuring that students remain engaged and willing to participate fully in the learning process (Purdy et al., 2022; Rudolph et al., 2014).

The concept of transfer of learning, as outlined by Knud Illeris (Illeris, 2016), offers a useful framework for understanding how students apply skills learned in one context to different, often unpredictable, settings. Illeris addresses the challenge of bridging the gap between formal education and practical application, stressing the importance of overcoming barriers between different learning environments. His work emphasizes the need for a balance between assimilative learning, which integrates new information into existing frameworks, and accommodative learning, which requires adapting one's existing knowledge to incorporate new insights. This balance is critical for the successful transfer of skills, particularly in simulation-based training where students must adapt learned communication strategies to diverse remote care scenarios (Illeris, 2016).

A central element of this study was the use of RPL, which played a crucial role in enhancing nursing students' decision-making, empathy, and professional accountability within e-communication contexts. RPL, as an approach to learning, encourages students to critically reflect on their experiences in practice, thereby deepening their understanding of the theoretical concepts they encounter. In the context of simulation-based training, RPL allowed students to examine their communication strategies after each scenario, fostering a deeper understanding of both their strengths and areas for improvement. Through structured debriefing sessions, which incorporated principles of RPL, students had the opportunity to assess their communication decisions, refine their strategies, and explore alternative approaches. This reflective process

is particularly significant in nursing education, where professional accountability and interprofessional collaboration are crucial. By reflecting on their experiences in a safe environment, students gained insights into how their actions impact patient care and team dynamics. RPL encouraged a deeper commitment to professional growth and ethical practice, helping students develop the critical thinking and clinical judgment necessary for effective nursing practice.

In line with Illeris's theory on the transfer of learning, the study confirms that structured debriefing, as a key element of RPL, plays a vital role in facilitating the transfer of skills and knowledge from simulation to real-world practice. By engaging in reflective practice, students are better able to apply their learning to diverse and unpredictable clinical situations. The ability to reflect critically on one's actions not only supports the development of communication skills but also strengthens empathy, decision-making, and professional accountability—competencies that are foundational to modern nursing practice.

Contribution to existing body of knowledge

This study contributes to the existing body of knowledge by providing empirical evidence on the effectiveness of simulation-based e-communication training in nursing education. It builds on previous research that highlights the value of simulation in developing clinical skills and critical thinking (Alharbi et al., 2024). This study shows that e-simulation in nursing extends beyond technical training to foster relational, ethical, and reflective capacities. Students developed deliberate strategies to navigate digital therapeutic communication, thereby extending theories of presence and empathic professionalism into virtual contexts. Simulations acted as structured disturbances where discomfort, uncertainty, and error became productive spaces for reflection and professional identity-building, resonating with Martinsen's notion of a "room for hesitation" and Dau & Nielsby's concept of reflective competence. Even technological breakdowns proved valuable, prompting adaptive leadership, professional judgment, and relational tact in ways that mirror telehealth practice. Preparation and psychological safety were crucial for engagement, enabling trust, collaboration, and shared professional identity. Role exploration, including taking the patient perspective, further strengthened empathic imagination and ethical awareness. Together, these findings position e-simulation as a pedagogical space where tech-

nical, relational, and ethical competencies intersect, underscoring the need for designs that balance challenge with safety and embed strong theoretical frameworks.

Conclusion

This study highlights the effectiveness of simulation-based e-communication training as a reflective learning tool for nursing students, enhancing their competence and confidence in digital communication. By incorporating designed disturbances like technological challenges and role ambiguity, the training provided authentic and constructive disruptions that improved students' ability to adapt, reflect, and engage empathetically in remote care settings. Through experiential learning and structured debriefing, students gained a deeper understanding of professional accountability, interprofessional collaboration, and patient-centred digital communication.

The findings confirm that reflective practice, when integrated into realistic and challenging simulation scenarios, boosts critical thinking, clinical judgment, and empathy—essential competencies for modern nursing practice. Additionally, the simulation design, rooted in pedagogical principles of disturbance, exploration, and modeling, aligns well with practice-oriented educational frameworks and offers a scalable approach for inclusion in broader healthcare education curricula. As digital communication becomes increasingly central to healthcare delivery, this training is a crucial step in preparing nursing students for the complexities of telemedicine and interdisciplinary care in the digital age.

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An Action-oriented Understanding of Reflection

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Abstract

This paper explores commonalities in antecedents, context, process, outcomes, and techniques that foster action-oriented Reflection through the pragmatic methodological processing of reflection theories from Mezirow, Dewey, Schön, and Reflective Practice-based Learning.

Despite the widespread adoption of reflective practices across various fields of study and practice, reflection remains a complex and challenging concept to comprehend. One of the reasons why reflection is difficult to understand is that the scientific work around reflection has often focused on defining different conceptions of reflection using different semantics. When researchers study reflection, they tend to analyze definitions of reflection instead of focusing on the phenomenon of reflection itself. Semantically rooted definitions represent how we should act, and not necessarily what happens when reflection occurs.

Signs of actions in reflection across the theories and Reflective Practice-based Learning are analyzed and presented as a theoretical model for Action-oriented Reflection. The model visualizes the process from pre-reflective sensing to the effect of reflective actions.

Keywords

Reflection, Education, Reflective Practice-based Learning, Reflection-in-action

Introduction

Across research projects, it has been demonstrated that the ability to reflect does not develop unless the right preconditions are present in the

learning contexts. Reflective teaching grounded in an understanding of adult learning has a measurable impact on students' development (Chen, 2014). In Reflective Practice-based Learning (RPL), "reflection moves to the heart of the learning process as a means of creating the important connection between theory and practice..." (Horn et al., 2020), focusing on the development of professional practice through students' professional identity, judgement, and action competencies (Kjærgaard et al., 2021).

Although reflection is a central concept in professional education, its application within goal- and test-oriented educational discourses often reduces it to an assessment tool or individualized cognitive process. This instrumental use contradicts foundational epistemological perspectives from reflection theorists, who emphasize reflection to enhance perception and develop professional wisdom (Canning, 2011; Goh, 2019).

While reflection is widely recognized as essential to pedagogical development and adult learning, there is a notable lack of research into how reflection connects to action. This gap is paradoxical, as reflection is assumed to generate knowledge that informs and improves practice (Mälkki & Lindblom-Ylännne, 2012). An empirical study shows that although student teachers may report, respond, and relate reflectively, they often struggle to reason, reconstruct, and represent their reflections. The limited ability to articulate reflective processes hinders the development of meta-reflective competencies and affects their capacity to judge and act meaningfully in complex professional situations (Goldman & Grimbeek, 2015).

This leads to the scientific focus: How can we understand reflection through capturing what happens when we reflect to qualify professional actions (action-oriented reflection)?

The goal is to uncover how reflection can be understood in a learning context that connects experience, thinking, and action (Horn et al., 2020). This occurs through the integration of theory and empirical publications, drawing on insights from both theoretical and empirical analyses and resulting in a model for Action-oriented Reflection. The model is designed by extracting theoretical and empirical analysis of signs of reflective actions based on the condensed summary of Peirce's pragmatic methodology.

Pragmatic Methodology

The Pragmatic methodology aims to enable work across different ways of understanding and perceiving objects and the world. Here, disagreements often stem from various types of knowledge, differing purposes or interests, the attachment of different meanings to words (i.e., conflicting beliefs about what words mean), or from one or both sides in a disagreement using words without a clearly defined meaning (Peirce, 1982c). Although numerous definitions exist, these often prescribe how reflection should occur instead of capturing what happens when we reflect. It is challenging to act based on and apply reflection when we do not understand reflection (Peirce, 1982a). As presented above, the vague and ambiguous definition of reflection is a product of all these issues.

Peirce offers a pragmatic methodology for understanding complex phenomena, such as reflection, through simple heuristics for discovering and exploring knowledge (Peirce, 1982d). By sensing the phenomenon, getting ideas about these sensations, and establishing beliefs about what the phenomenon contains (conceptualization), we can develop beliefs, forming our habits we act upon (Peirce, 1982b). The meaning we assign to phenomena does not necessarily reflect the actual concept of the phenomenon; our conceptualization can be entirely incorrect, either due to a lack of knowledge as knowledge develops over time or because we have an interest in presenting the concept in a certain way (Peirce, 1982c).

The basic thesis for processing theory and empirical data is methodologically simple; nothing new can ever be learned by analyzing definitions, as these represent how we should act, not what happens in a given phenomenon (Peirce, 1982a).

Analytical framework

Building on these insights, observable signs offer a robust foundation for analysis. Peirce defines different types of signs emerging from 1) sensory impressions, 2) language (Peirce, 1982b), and 3) concrete actions (Peirce, 1982d). The signs play distinct roles. Sensory (or perception) signs provide the raw emotional and intuitive inputs, while language signs tend to oversimplify the inherent complexity of reflection. In contrast, action signs capture the specific behaviors and routines that embody reflection. This differentiation highlights the necessity of focusing on these tangible indicators to determine exactly when and how reflection occurs.

Complementing this approach, Peirce presents degrees of the signs' clarity. These degrees refine the analysis further. The first degree pertains to the logical, directly observable characteristics of reflection. The second degree abstracts these observations to define reflection more comprehensively by identifying inherent properties and excluding non-relevant aspects. The third degree assesses the practical effects resulting from reflective actions. Together, these insights culminate in the formulation of five essential analytical questions for the study.

Table 1: Analytical Questions

When does reflection occur? (Stimuli)	This question arises by pinpointing the specific stimuli—what is sensed—that trigger the reflective process (Peirce, 1982d).
How does reflection occur? (Action)	Here, the focus is on the actions—the observable behaviors and routines—that unfold as part of reflection (Peirce, 1982b).
What are the characteristics of reflection? (1. degree of Clarity, provided by the Action Signs)	In answering this, the study identifies the basic, factual traits of reflection that remain constant across contexts (Peirce, 1982c; Peirce, 1982b).
What are the properties of reflection? (2. degree of Clarity, provided by the Action Signs)	This question delves deeper by exploring the inherent features (Peirce, 1982b) and their oppositions (Peirce, 1982b), thereby providing a more abstract definition.
What are the effects of reflection? (3. degree of Clarity, provided by the Action Signs)	Finally, the analysis examines the outcomes produced by reflective actions and how these effects manifest in practice (Peirce, 1982b).

These questions are derived by mapping the stages of perception, thought, and action central to Peirce's pragmatic framework. They provide a structured way to differentiate between the observable processes and the abstract conceptualizations of reflection. By analyzing reflection theories and the data about RPL through these five questions, the methodology captures the dynamic interplay in reflection. It ensures that the model developed is both practical and testable. This approach enables a reflective and iterative process, where theoretical insights and empirical observations continually inform and refine our understanding of reflection in professional learning contexts. The pragmatic methodology

is a reflective tool (Peirce, 1982a) that can help the curious individual understand reflection and its mechanisms. This description includes an important time aspect: from the first verbalization of reflection as a phenomenon to the current conceptualizations that exist, a couple of thousand years have already passed. A final conceptual clarity of reflection has still not been achieved; achieving this clarity takes a considerable amount of time because we assign meaning to the world and phenomena when we sense them, often without thinking about where ideas regarding reflection are grounded (Peirce, 1982b).

Reflective Practice-Based Learning

The empirical component draws on data from the case study of RPL at University College Nordjylland (UCN) from 2013 to 2019. The data outline reflection in the educational settings of UCN before the organizational Program for Reflective Practice-based Learning published the “Whitepaper on Reflective Practice-based Learning” (Horn et al., 2020).

Between 2013 and 2018, RPL was loosely defined across organizational perspectives, philosophical questions, and pedagogical ideas. This loose definition led to a more diverse and less scientific approach to RPL, with a range of contributors publishing about RPL with less alignment in theoretical stance.

The publications about RPL after 2019 follow a narrower theoretical definition of reflection, all based on a cognitive understanding of reflection aligned with the presentation of theories and/or principles for learning and teaching as defined in the White Paper. The most significant publications on reflection after 2019 are Kirkegaard (2021), Bundgaard et al. (2023), Kjærgaard & Andersen (2023), and Gyldendahl, Georgsen & Dau (2023). These publications contribute in their way to the understanding of reflection in education, through the theoretical mapping of reflection and educational research that involves reflection. However, none of the publications define fundamentally different actions linked to reflection in RPL. Therefore, no new empirical analysis has been conducted. Instead, this paper positions itself as a contribution to reflection in RPL, drawing on publications from 2013 to 2019, with an emphasis on the following points from RPL after 2019.

In “Whitepaper on Reflective Practice-based Learning” (Horn, 2020), reflection is presented in learning contexts as learning to act in specific

ways in professional practice and, at the same time, being able to argue for the motivations behind the actions. The emphasis on actions as key to reflection in learning contexts continues in “Theory and Practice in Professional Educational Didactics” (Kirkegaard, 2021). Here, various reflection theories are presented in an educational context, with a focus on action. The abstract and intangible nature of reflection, also presented in this publication, underlines that reflection is difficult to understand clearly and distinctly. The phenomenon of reflection maintains its mysterious and indefinable conceptualization in RPL despite the publication offering one commonality across the many types of reflection presented: “...but what is common to all is that they emphasize how what has been learned can be applied in new situations in practice.” Based on these two publications centered on reflection in RPL, reflection in professional educational contexts involves applying knowledge through argumentation and action.

The empirical processing

The empirical data consists of material from 120 units available in UCN’s internal database or accessed through UCN’s former Director of Education, Peter Møller Pedersen. Empirical material processed range from a special issue on Reflective Practice-based Learning in Cepra-Striben (Bjerre, et al. 2016), books (Dau, 2018; Pjenggaard, 2018), communication materials (UCN, 2015a), video materials ranging from advertisements for individual programs to interviews with internal and external researchers (Professionshøjskolen UCN, 2016a; Professionshøjskolen UCN, 2016b; Professionshøjskolen UCN, 2017), documents related to projects on Reflective Practice Learning (Sørensen & Nielsen, 2018), PowerPoints and meeting minutes (UCN, 2015c; Dau, 2016b), UCN’s institutional accreditation from 2017, strategic documents (Kirkegaard, 2018) and the draft for “Whitepaper on Reflective Practice-based Learning” (Horn, et al. 2019). This data set represents the documented attempt to define a pedagogical framework for adult learning in higher education outside the universities. Since Reflective Practice-based Learning has been incorporated as part of the pedagogical-didactic basis at several other educational institutions in Denmark (DMJX, CPH Business), the data is somewhat generalizable beyond the UCN setting.

Table 2: Search Protocol Reflective Practice-Based Learning

1. Define your research subject and describe the specific focus of the performed search:	2. List the aspects that your subject contains and the search terms for each of the aspects:					
"What has been written so far about Reflective Practice-based Learning at UCN? The focus is: Reflective Practice-based Learning.	<table border="1"> <tr> <td>Aspect 1 Refleksiv praksislæring/Reflective Practice-based Learning</td><td>Aspect 2 RPL</td><td>Aspect 3 Læringstilgang</td></tr> </table>			Aspect 1 Refleksiv praksislæring/Reflective Practice-based Learning	Aspect 2 RPL	Aspect 3 Læringstilgang
Aspect 1 Refleksiv praksislæring/Reflective Practice-based Learning	Aspect 2 RPL	Aspect 3 Læringstilgang				
3. Define your inclusion and exclusion criteria (both formal characteristics (e.g., study design, language, year) and content-related considerations)	4. The performed searches					
Inclusion criteria	Publication year 2001-2018 Language: Danish and English	Source	Search query (paste your exact query from the searched source to include field codes in the search query)			
Exclusion criteria	All documents where Reflective Practice-based Learning or RPL is not mentioned or is not described.	UCN Intern	Refleksiv praksislæring OR RPL OR Reflective Practice-based Learning OR Læringstilgang			
5. Search Results						
Source	Number of results and number of relevant results in parentheses	Date of performed search	Limitations (year, publication type, peer reviewed...)			
UCN Intern	194 (120)	15/11-2018	Publication year 2012-2018			

The empirical data have since been processed through three condensations.

1. The empirical material for this paper is drawn from 97 pages of primary data on RPL. In the initial review, conducted in November and December 2018, passages explicitly addressing Reflection were identified.
2. Methodologically, the first review involved screening the full dataset to locate instances where the concept of Reflection appeared beyond the adjectival use of “reflective” in “Reflective Practice-based Learning.”
3. In the second review—the basis for the present analysis—only those passages explicitly related to Reflection’s action signs (meaning passages that can answer one of the five analytical questions described in the analytical framework) were retained.

This systematic approach excluded all material not directly concerning RPL, Reflection, and its action signs. Passages without identifiable action signs concerning Reflection were deemed unsuitable for understanding Reflection in RPL. While the broader RPL material contains various

conceptualizations of Reflection, these were excluded from the case unless explicitly connected to RPL as presented in Table 3.

Table 3: Empirical Action Signs Categorized by the Analytical Questions

When does Reflection occur? (Stimuli)
<ul style="list-style-type: none"> – When we start doing something, when we begin working with the material, engaging in teaching, and trying things out, we discover what we know (Professionshøjskolen UCN, 2016b, t. 11.02–11.23) – Learning to understand and accept one's own and others' defense mechanisms (Pjenggaard, 2016c, s. 23) – When we experiment and try – Focus placed on experiences and/or practical encounters (Horn et al., 2019, s. 16)
How does Reflection occur? (Action)
<ul style="list-style-type: none"> – Taking ownership of our professional practice, critically examining our own learning, experiences, knowledge, and practice (Haastrup & Knudsen, 2016, s. 89) – Watching ourselves and others on video, noticing the small important details that can be applied in real professional settings, articulating what we do (UCN, 2015a, P4) – Using portfolios, logbooks, feedback, self-regulation, and systematic reflection exercises – Facilitating both a systematic reflection process, professional summaries, descriptions of learning outcomes, and feedback (UCN, 2015a, P1) – Acquiring professional knowledge at a higher level of abstraction than immediate practice- Being prepared by participating actively, using active listening, applying professional terminology, engaging critically (Næsby, 2016, s. 49) – Being thoughtful, evaluative, and assessing ourselves and our professional performance in relation to the profession and others – Turning other and past situations into mental and bodily representations that can be consciously recalled (Dau, 2016a, s. 70) – Interpreting interpretations (both the interpreter's and the interpreted's perspectives) (Næsby, 2016, s. 44) – Being influenced by interaction with the environment, including other people (Dau, 2016b, s. 2) – Challenging classical stimulus-response patterns and creating new meanings between stimuli and responses (Pjenggaard, 2016c, s. 21+22) – Engaging ourselves in interdisciplinary contexts (Professionshøjskolen UCN, 2016a, t. 5.55–6.20) – Being argumentative, professional, and objective in our identity (Professionshøjskolen UCN, 2017, t. 1.15–1.28) – Structuring cognitively and metacognitively (Dau, 2018, s. 35) – Experimenting and testing the implications of actions (Horn et al., 2019, s. 16)
Characteristics of Reflection (1. degree of Clarity, provided by the Action Signs)
<ul style="list-style-type: none"> – Tackling challenges in our work with a kind of improvisation, challenging and developing practice – Seeing multiple and different aspects of the same issue, aligning expectations, setting clear goals, making the learning process visible (Næsby, 2016, s. 50) – Questioning concepts and models, questioning the conceptual framework present- Interpreting one's own and others' defense mechanisms – Reading not only between the lines but behind the lines to understand actions in practice (Pjenggaard, 2016c, s. 22)

- Observation, abstract conceptualization, active experimentation, and thinking as an integrated circular process (Dau, 2016a, s. 72) – Linking experiences with conscious applications (Pjenggaard, 2016a, s. 5) – Thinking beyond practice familiarity while being able to analyze and discuss it on a general and explicit knowledge basis (Bjerre, 2016, s. 39) – Progressive professional competence, meaning-making from experience to deeper understanding through interaction with others – Investigative processes and an element of critical thinking and metacognition- Being reflective human beings- Bridging theory and practice (Dau, 2016b, s. 4)

Properties of Reflection (2. degree of Clarity, provided by the Action Signs)

To be innovative, independent, and productive in the labor market; to think in terms of new solutions (UCN, 2015c) – the development of ourselves as individuals (UCN, 2015c)

- Relating to oneself, taking responsibility for existence, entering into presence with others, understanding others' perspectives with empathy and self-awareness (Pjenggaard, 2016d, s. 30) – stimulus and response are in a complementary relationship that emphasizes the individual's inner reflexivity and the group's dynamic co-creation and reflections; this complementarity distinguishes the approach from the most radical behaviorist theories (Pjenggaard, 2016d, s. 33+34) – it provides meaning to why we should invest effort in learning (Pjenggaard, 2016c, s. 19) – distancing ourselves from practice, rising above it, and socializing and mediating (Bjerre, 2016. s. 38+39) – exercising professional judgment that enables us to manage a given practice (Dau, 2016a, s. 75) – learning and independently and in collaboration with others developing and shaping our professional identity, our professional competencies, and our personal judgment (Pjenggaard, 2016a, s. 6) – an integrative way of thinking that involves multiperspectivity or shifting positions (Pjenggaard, 2016d, s. 34) – assessing whether a method, a concept, or a development project is beneficial for practice and the target group, and evaluating how and why and for whom it should be implemented (Næsby, 2016, s. 43) – critical examination of one's own learning, prior assumptions, knowledge, and practice (Næsby, 2016, s. 44) – mirroring what has been observed, recognizing what has been observed, referring to oneself, distinguishing between thinking about something, processing information, and communicating it (Næsby, 2016, s. 45) – we must not do too little (Professionshøjskolen UCN, 2016b, t. 10.44–11.00) – developing through an ongoing dialogue – making intelligent decisions (Kirkegaard, 2018, s. 1)

Effects of Reflection (3. degree of Clarity, provided by the Action Signs)

- Silent, bodily, social, mental/cognitive horizontal and vertical, and identity-developing activities – Differentiating between learning perspectives without fully separating or detaching them, using perspectives integratively and pluralistically (Pjenggaard, 2016b, s. 17) – Learning together in and from practice – Seeing ourselves within the profession, mastering strategies, understanding the complexity of the profession, and acquiring relevant professional competencies (Pjenggaard, 2016a, s. 6) – Developing ethical judgment based on knowledge, sensation, and experience (Dau, 2016a, s. 77)

– Taking ownership of our professional practice, bringing our personal values and identity into play (Næsby, 2016, s. 44) – Creating progress after reflection, deciding whether to move forward or step back (Professionshøjskolen UCN, 2016b, t. 10.23–10.35) – Contributing ideas from our own position, suggesting solutions, enhancing understanding of dynamics and challenges (Professionshøjskolen UCN, 2016a, t. 4.27–5.24) – Ensuring authentic reflection, Avoiding the blending of theory and practice, Developing reflective skills, changing perceptions, translating everyday concepts into scientific concepts- Providing a professional foundation for engaging with practice – Developing craftsmanship competencies, Applying knowledge, techniques, and reflection through practical expertise, Establishing synthesized understandings (Bjerre, 2016, s. 40+41) – Providing guiding principles for practice- Experiences from practice contributing to innovative solutions that make a difference (Pjenggaard, 2018, s. 323) – Expanding reflective repertoires and shaping creativity (Næsby, 2016 s. 43) Developing and strengthening professionalism, being thoughtful and evaluative regarding practice and learning (Næsby, 2016, s. 43) – Understanding how different levels affect the ability to reflect, tell and mirror events or practices, integrate knowledge, and use it as practical skills in context (Kirkegaard, 2016, s. 84) – Seeing multiple and different aspects of an issue – Further developing the profession, associated learning, and identity understanding (Sørensen & Nielsen, 2018 s. 2) – Changing actions and finding new forms over time – Engaging in dialogue with tasks- Describing and explaining actions, collaborating to develop practice – Experimenting and testing the implications of actions – Always relating actions to both the external environment and ourselves (Horn et al., 2019, s. 16)

The empirical data approach reflection through similar conceptual lenses as those presented in the theories below. While it reflects a somewhat dualistic separation of theory and practice, it favors an integrative stance that seeks to dissolve this divide. In an educational context, the empirical material weaves together many of the theoretical insights, providing concrete tools and detailing learner interactions concerning the theories.

Reflection theories from Mezirow, Dewey, and Schön

The theoretical foundation of this study is grounded in dominant theories of reflection and learning, which are rooted in experiences, action, and thought, and philosophically informed by pragmatism. This study draws on the conceptual action signs analyzed in “How We Think” (Dewey, 1997), “Teaching Artistry Through Reflection-in-Action” in “Educating the Reflective Practitioner” (Schön, 1987), and “How Critical Reflection Triggers Transformative Learning” in “Fostering Critical Reflection in

Adulthood – A Guide to Transformative and Emancipatory Learning” (Mezirow, 1990).

The theoretical processing

The theoretical data have been analyzed and condensed twice. First, all sentences in the texts containing reflection have been marked. Next, only those passages explicitly related to Reflection's action signs (meaning passages that can answer one of the five analytical questions described in the analytical framework) were retained and categorized through the five methodology questions as presented in Table 4.

Table 4: Theoretical Action Signs Categorized by the Analytical Questions

When does Reflection occur? (Stimuli)		
Dewey	Schön	Mezirow
<ul style="list-style-type: none"> - An immediately experienced situation and its nature (problematic or confusing) - The impulse for exploration is awakened - Doubt, hesitation, confusion, or mental challenges - Spontaneous thoughts and ideas - Sensory perceptions - Feeling the problem's conditions - Memory - Past and future - Paralysis of action - Prior experiences - Lack of understanding; partial absence of meaning 	<ul style="list-style-type: none"> - Knowledge-in-action - A surprising experience - Encountering surprise or wonder - A unique or uncertain situation - When we are somewhat conscious, even if not linguistically expressed - During developmental or challenging experiences 	<ul style="list-style-type: none"> - Dilemmas and prior learning - Anomalies and dilemmas that do not make sense - trigger-events - The need to understand the meaning of our experiences
How does Reflection occur? (Action)		
Dewey	Schön	Mezirow
<ul style="list-style-type: none"> - We raise questions - Initiate ideas - Question our own habits - Turn themes of our habits upside down 	<ul style="list-style-type: none"> - Construct our practice situations 	<ul style="list-style-type: none"> - Interpreting dynamic interaction between meaning, habit, and an event - Mirroring and comparing an experience

<ul style="list-style-type: none"> - Subject themes to serious and coherent consideration - Engage ourselves in investigating what we do not understand - Choose to actively engage with experienced situations - Problematize experiences - Pursue knowledge and explore objectively - Examine grounds for opinions and perceptions - Investigate credibility, value, and intention of beliefs - Pose intellectual questions about what needs solving - Use spontaneous thoughts as guiding hypotheses - Initiate action based on inquiry to remove doubt and confusion - Process thought-states for possible solutions - Observe and assess the situation - Recognize the character of the situation - Engage with the facts - Test the value of indications - Examine guarantees supporting ideas - Think intellectually about prior ideas - Uncover relationships - Reason logically 	<ul style="list-style-type: none"> - Refer to sequences of operations and procedures, signs noticed, rules followed, and values, strategies, assumptions underlying "theories-in-use" - Question the assumed structure within knowledge-in-action; critical function - Learn to recognize and apply standard rules, facts, and operations - Make inferences from general rules to specific cases - Develop and test new forms of understanding and action 	<ul style="list-style-type: none"> - Reviewing content or procedural assumptions - Checking if all relevant options for action are identified - Assessing consequences of alternative perceptions or hypotheses - Controlling variables - Using problem-solving methods - Carefully concluding based on evidence - Interpreting feedback from actions - Reflection before, during, and after decision-making - Examining the bias in problem framing - Focusing on procedures, methods, or premises - Subjecting ideas to rational and reflective discourse - Critically reviewing evidence and arguments - Withholding personal biases - Challenging established problem definitions - Critical review ensuring accurate identification of patterns and metaphors - Reevaluating assumptions underlying beliefs
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Characteristics of Reflection (1. degree of Clarity, provided by the Action Signs)

Dewey	Schön	Mezirow
<ul style="list-style-type: none"> - Intellectual and practical commitment - Refers to situations - Mental elaboration of ideas or assumptions - Reasoning 	<ul style="list-style-type: none"> - Reflecting after the surprising event - Pausing to reflect during the event - Reflecting mid-action - Transforming actions while acting - Integrated thinking and acting 	<ul style="list-style-type: none"> - Validation of knowledge - Correction of distortions in reasoning and attitudes - Active interpretation of thoughtful action - Involves an element of critique - Challenges the validity of prior learning assumptions

<ul style="list-style-type: none"> - Identification of evidence through meanings and indications - Experimentation - Logical inference - Use of reason - Anchored in the reflectors' current context 	<ul style="list-style-type: none"> - Not necessarily relying on systematic consideration - Drawing on multiple insights simultaneously - Undergoing reflection without necessarily verbalizing it - Leads to rethinking parts of knowledge-in-action - Affects what we do 	<ul style="list-style-type: none"> - Premise reflection - Concerned with "why"; the reasons and consequences behind actions - Reevaluation of problem framing - Reevaluation of personal orientations toward perceiving, knowing, believing, feeling, and acting
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Properties of Reflection (2. degree of Clarity, provided by the Action Signs)

Dewey	Schön	Mezirow
<p>Opposites: - Driven by impulses, unchecked desires, whims, or momentary circumstances - Insufficient critical assessment of ideas - Accepting that one thing indicates another without inquiry - Settling for familiar relations - Not using ideas for new observations</p> <p>Properties: - Inquiry and testing of facts and ideas - Investigating grounds for beliefs - Recognition of true meaning - Observation and judgment - Judgmental, understanding, and linguistic - Constructing purposeful and meaningful actions</p>	<p>Opposites: - Pushing surprise aside - Selective inattention - Reliance solely on knowledge-in-action</p> <p>Properties: - Critical function questioning assumptions - Thinking and acting - Learning new ways to apply existing competencies - Acting based on conclusions drawn from reflection - Thinking, learning, and acting integrated - Clear linguistic description of reflection-in-action - Reflecting on descriptions of reflection-in-action - Reflecting on phenomena and implicit understandings - Experimenting to generate new understandings</p>	<p>Opposites: - Rejecting perception and cognition - Escaping through defense mechanisms - Acting based on biases, distortions, and provincialism - Acting from past experiences without reassessment - Reflexive but not reflective behavior - Naive acceptance or rejection of validity claims</p> <p>Properties: - Judgment through stages of reflection - Immediate decision-making - Critical review of distorted assumptions - Evaluating why and how we perceive, think, feel, act - Reflection based on situation-specific "why" - Evaluation of implicit assumptions in beliefs - Integral to decision-making - Ex post facto critique - Reevaluation and potential transformation of meaning schemes - Challenging habitual expectations and perspectives - Accurate identification of patterns and metaphors in meaning frameworks</p>

Effects of Reflection (3. degree of Clarity, provided by the Action Signs)		
Dewey	Schön	Mezirow
<ul style="list-style-type: none"> - Changing habits of action - Benefiting oneself and the world - Granting freedom - Influencing the future - Establishing lasting methodological habits - Modifying understanding of ideas - Leading to new actions - Providing practical applications of ideas - Generating action proposals - Courage to make mistakes 	<ul style="list-style-type: none"> - Reconstructing strategies of action - Reconstructing understandings of phenomena and problems - Providing experimental approaches to new actions - Testing and confirming or rejecting tentative understandings - On-the-spot experiments influencing actions - Building and testing new categories of understanding and strategies - Challenging oneself critically - Uncovering tacit creative processes in practice - Shaping future actions - Developing new knowledge-in-action - Developing new theories or frameworks - Acquiring professional knowledge - Understanding uncertain situations - Effectively handling divergent situations in practice 	<ul style="list-style-type: none"> - Correcting distortions in beliefs and reasoning - Reinterpreting to enable new actions - Critically questioning foundational assumptions - Discarding outdated knowledge - Reflecting back to assess prior learning validity - Deepening and strengthening frames of reference - Creating or transforming meaning schemes - Transforming nonviable perspectives - Acting based on transformed insights - Enabling transformative learning - Potentially changing social norms - Guiding better problem-solving strategies - Affecting how and why we act - Reorienting problem-solving efforts - Achieving perspective transformation - Developing critical awareness of limiting assumptions

Each theorist offers distinct but overlapping perspectives on the stimuli that initiate reflection, the actions through which reflection unfolds, the key characteristics and properties of reflective processes, and the effects on learning, action, and professional development.

Analysis

The analysis extracts and unfolds the key action signs from the empirical data and theories presented above. All sentences from the empirical data

and theories used in the following analysis are marked with cursive in Tables 3 and 4. The goal is to present a model of action-oriented reflection through simple prescriptions. The framework for the analysis is the three degrees of clarity. They provide a structured way to conceptualize action-oriented reflection across observable and basic traits – the “what is reflection”, the more abstract inherent features – the “when and how to reach reflection”, as well as the “effects of reflection”.

1st Degree of Clarity: Characteristics and Actions of Reflection

Reflection is a **developmental circular process**. We **challenge** ideas, beliefs, and habits through **exploration, assessment, and testing** using our senses, thoughts, and actions to establish habits for action. Reflection has a beginning and an end, but one reflective conclusion can be followed by a new reflective start.

Through the reflective circular process (empirical data), we form ideas based on our interpretations (Mezirow, empirical data) of the dynamic interactions between meaning loss and our habits for action.

Understanding and actions challenged through exploration, assessment, and testing summarize the criteria for development to be characterized as reflective. These criteria highlight how reflection occurs, as we relate to multiple dimensions of the reflective process and challenge them. Challenging (empirical data, Schön, Mezirow) experiences, definitions, and patterns are a collective term for perspective shifts, questioning, and relating in the reflective process and summarize, along with development, the characteristics of reflection.

A central part of the exploration is questioning (Dewey, Schön, Mezirow, empirical data) what is happening/our experience, our habits/actions, and the assumed knowledge/thinking. We assess (empirical data, Dewey, Mezirow) the ideas formed, relating them to ourselves and the object of reflection across experiences, thinking, and actions. We test our ideas (empirical data, Schön, Dewey) throughout the exploration, combining acting and thinking to examine them. Engaging in tests confirms or refutes whether reflective-generated ideas contribute to understanding.

Development (Schön, empirical data) conceptualizes the process and goal of reflection. The process summarized by this term is a development across our interpretations of experiencing, thinking, and acting, both

alone and with others, as well as a description of our state of mind when reflecting.

Model condensation

This informs the model's layout: a circular developmental frame that flows towards new reflective processes with a defined beginning and end. Central to the reflective process is the challenging of ideas, beliefs, and habits. How to challenge these is outlined by the reflective actions: Exploration, assessment, and testing.

2nd Degree of Clarity: Properties and Conditions of Reflection

Reflection is **triggered** by **experiences** we can not make sense of. The reflection is conditioned by the complementary relationship between the **situated** experience, our **willingness to engage**, and **circumstances that foster examination**. In this process, **ideas**, **beliefs**, and **habits** are challenged to **develop understanding**. This enables us to **shift perspectives** to **establish, integrate, and evaluate** ideas, beliefs, and habits.

The state of us and our surroundings is as crucial as our capacity for reflective thought for reflection to be triggered (empirical data, Dewey, Schön, Mezirow, Peirce). Circumstances in our self and our surroundings influence the starting point for any reflection, making the properties of reflection situational (empirical data, Dewey, Schön, Mezirow) and placing the “when” of reflection outside cognition.

What we cannot make sense of refers to our need to construct meaningful actions (Dewey). The meanings we assign to a given context start as ideas (Peirce) that we examine. We gradually form beliefs (Peirce) about what we are trying to understand by sensing, acting in, and thinking about the world. Beliefs help frame the process by which we reestablish meaning (Dewey, Mezirow, empirical data), are the basis for our actions, and denote our habits of action (Peirce).

Trigger (Mezirow) is the comprehensive term for stimulus and response (empirical data), impulse (Dewey), sensory perceptions (Dewey), the somewhat conscious but not necessarily linguistically expressed experienced challenge (Schön), and the experience of not making sense and the need for making sense (Mezirow).

Actively engaging (Dewey, empirical data) with what we cannot understand refers to the starting point for how reflection occurs. This process can be either desire-based in the past or future (Peirce, Dewey) or

a necessity in the present (Peirce, Schön). “Willingness to engage” contains challenging one’s own and others’ learning, prior assumptions, knowledge, and practice (empirical data) as well as being open through inquiry (Dewey, Schön, Mezirow). Based on the challenge of developing understanding, we generate new insights (Peirce, Dewey, Mezirow, empirical data), developing our ability to shift perspectives (empirical data, Mezirow); establishing awareness that the conditions triggering reflection are not one-dimensional. This influences how we see the world and ourselves within it, allowing us to adopt perspectives beyond our own.

Integrating established ideas, beliefs, and habits possesses an evaluative property (Dewey, Mezirow, empirical data), combining assessments in the reflective process, both independently and in collaboration with others, develops and shapes our professional identity, competencies, and judgment (empirical data).

Model condensation

The conditions add a layer of situational context: when a trigger event is experienced. The conditions also inform how to reach reflection: through the individual/collective modus of willingness to engage and circumstances that foster examination. The conditions of reflection highlight that adopting perspectives beyond our own by shifting between acting, sensing, and thinking in the exploration, testing, and assessment of ideas, beliefs, and habits will shape our professional identity, competencies, and judgment.

3rd Degree of Clarity: Effects of Reflection

Reflection **changes habits** of action. It **develops** our ability to **understand coherence** between situations, our experiences, and different **ideas, beliefs, and habits** to **establish or evaluate actions**. The effect of reflection is to act as qualified as possible **over time**.

The third degree of clarity in reflection as a concept is its effect: understanding. Reflection results in actions based on understandings from the reflective process (Dewey, Schön, Mezirow, empirical evidence). Reflection affects how we interact with and engage in our surroundings. By challenging and examining one’s own and others’ interpretations of stimuli and actions, reflection determines how we behave and act in the future. Over time and through growing maturity, reflection enables us to validate actions through coherence (Dewey, Mezirow, empirical data)

in experience, thinking, and action across internal and external contexts and to a meta-level. All this to act effectively in practice (Schön). Coherence is processing many complex components, leading to understanding and acting as qualified as possible (Schön, Mezirow).

Based on the characteristics and properties of reflection and the added effect of coherence in reflection, four levels of reflection occur: 1) Challenge what is sensed to establish habits, 2) Challenging through shifting perspectives to develop habits, 3) Evaluating reflective habits to develop habits, 4) Developing the habit of sensing, thinking and acting in coherence while challenging habits in diverse situations in practice (Schön).

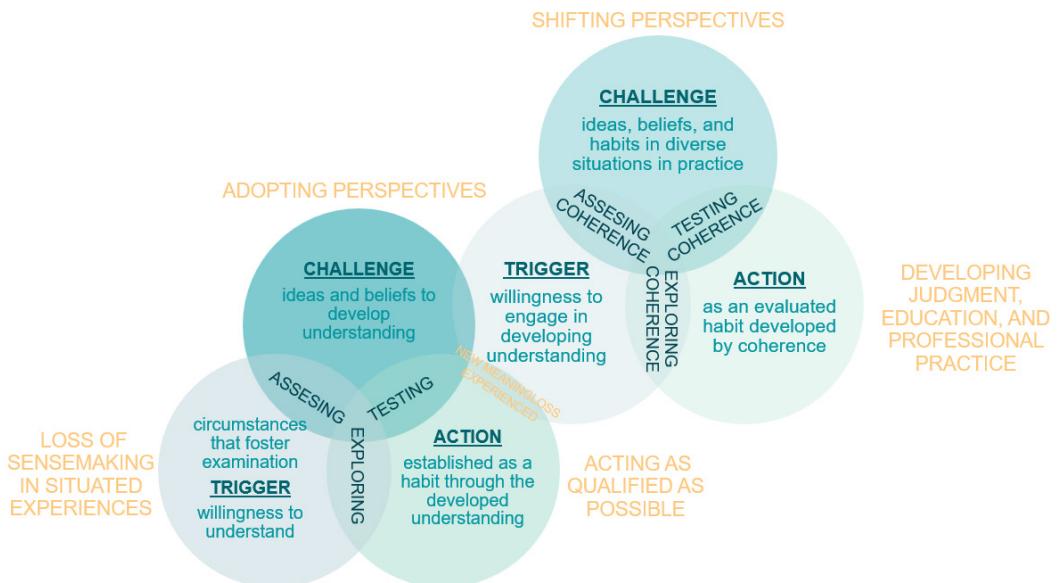
This means that reflection affects both a) individual reflective practice – the development of professional judgment and identity (empirical data), b) social understandings – for example, in educational contexts (empirical data, Dewey, Mezirow), and c) societal development – how we can qualify and develop professional practice through agency (empirical data, Schön, Mezirow). The effects of reflection in all three contexts are interdependent and develop each other. Common to all these effects is that, in practice, reflection affects how and why we act, think, and experience. Schön provides a fine formulation of the effects of reflection, including on itself: In reflection, we not only act based on already thought-out methods of consideration but also challenge and critically examine our reflection. Here, reflection has methodological, understanding-oriented, and action-oriented effects.

Model condensation

Adding the evaluation of habits to the model as a result of reflection marks the third level of the reflective process. Connecting two reflective processes visualizes the timely factor. Coherence will be implemented in the second reflective process to represent the fourth level of reflection. The effects of the circular process are the continuous development towards qualified judgment, education, and professional practice as the highest parameter for qualifying actions.

Model for Action-oriented Reflection

Model 1: Action-oriented Reflection



Conclusion

Understanding reflection and being able to reflect in higher education is a developmental process. To achieve reflection, we must foster circumstances that develop our willingness to understand and our ability to challenge the experiences, actions, or thoughts that trigger us. The suggestion that the emergence of reflection does not relate to a cognitive exercise is the most important finding in this paper. Both empirical data and the theories imply that reflection relies on both external and internal conditions being right. When these conditions are met, we can develop understanding through exploring, assessing, and testing by sensing, thinking, and acting. Along the way, several pathways can be integrated to attain different levels of reflection, always tracing a line that begins with the emergence of reflection and culminates in its effects. Reflection leads to the development of beliefs and habits of acting based on our reflective understanding. Not including empirical data on Reflective Practice-based Learning published after 2019 can be argued as a limita-

tion to the paper's validity. A triangulated analysis containing this data set and the data set from Gyldendahl Jensen, C., Georgsen, M., and Dau, S. (2023) would offer a more representative understanding of reflection across higher educational contexts.

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RPL in Teacher Education: A Science Teacher Education Example from the USA

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Abstract

For effective preparation to teach science, practice-based learning experiences are of paramount importance. However, practice alone is not sufficient for developing effective teaching attributes. Reflection on the practice is equally important to develop the desired attributes. Effective teaching requires far more than learning a few specific skills or techniques. A reflective mindset involving evaluation of the practice is essential for understanding and improving on various elements of effective teaching. Thus, learning experiences in teacher education must “marry” practice to reflection in order to produce competent teachers. In the context of science teaching, the fundamental question becomes, what are the key elements of effective science teaching and how can they best be taught to pre-service teachers (PSTs)? The author has attempted to address these questions by “marrying” practice and reflection in secondary science teacher preparation across three universities over 26 years in the USA. This “marrying” was done at three levels: Specific assignment-based, full course-based, and an entire program-based reflection on practice. This paper focuses only on the results of a course-based reflection on practice in one science teacher education program. The research question being explored and addressed is: To what extent do the reflective, practice-based course level experiences lead to a shift in PSTs’ mindset regarding key elements of effective science instruction?

Qualitative analysis of PSTs’ responses to an open-ended question, given as a pre- and post-course assessment, was conducted. The results indicate that the 5E Model of the Learning Cycle Approach to science instruction enabled pre-service teachers to shift their mindset regarding key elements of effective science instruction.

Keywords

Science Teacher Education, 5E Model, Learning Cycle, Secondary Science Education, Science Instructional Practices

The Challenge or Problem

The primary purpose of a pre-service science teacher education program is to prepare teachers for effective science instruction. One might ask, though, what does effective science instruction mean or look like? During the final decades of the 20th century, national documents in the USA, such as *Science for All Americans* (American Association for the Advancement of Science, 1990), *Benchmarks for Scientific Literacy* (American Association for the Advancement of Science, 1993), and the *National Science Education Standards* (National Research Council, 1996), provided guidance about elements of effective science instruction. More recently, during the opening decades of the 21st century, *A Framework for K-12 Science Education* (National Research Council, 2012) introduced the idea of a 3-Dimensional science instruction, premised on the recognition of the following THREE dimensions of science to serve as key elements of effective science instruction: Disciplinary Core Ideas; Crosscutting Concepts; and Scientific and Engineering Practices. Usually, pre-service teachers (PSTs) develop the knowledge of disciplinary core ideas through the disciplinary content courses, such as courses in biology, chemistry, etc. However, learning to teach those disciplinary core ideas in a manner so as to weave the crosscutting concepts and engage students in the scientific and engineering practices (the other two dimensions of the 3-Dimensional approach), is expected to be accomplished in the so called 'teaching methods' courses. These courses are sometime 'stand-alone' and sometime coupled with field experiences (practice-based learning) in school classrooms. The ability to implement 3-Dimensional science instruction effectively, may be termed "pedagogical capital". Enabling PSTs to develop the "pedagogical capital" for such instruction poses a major challenge in those teacher education programs that include only ONE science 'teaching methods' course within which most, if not all, pedagogical preparation must occur.

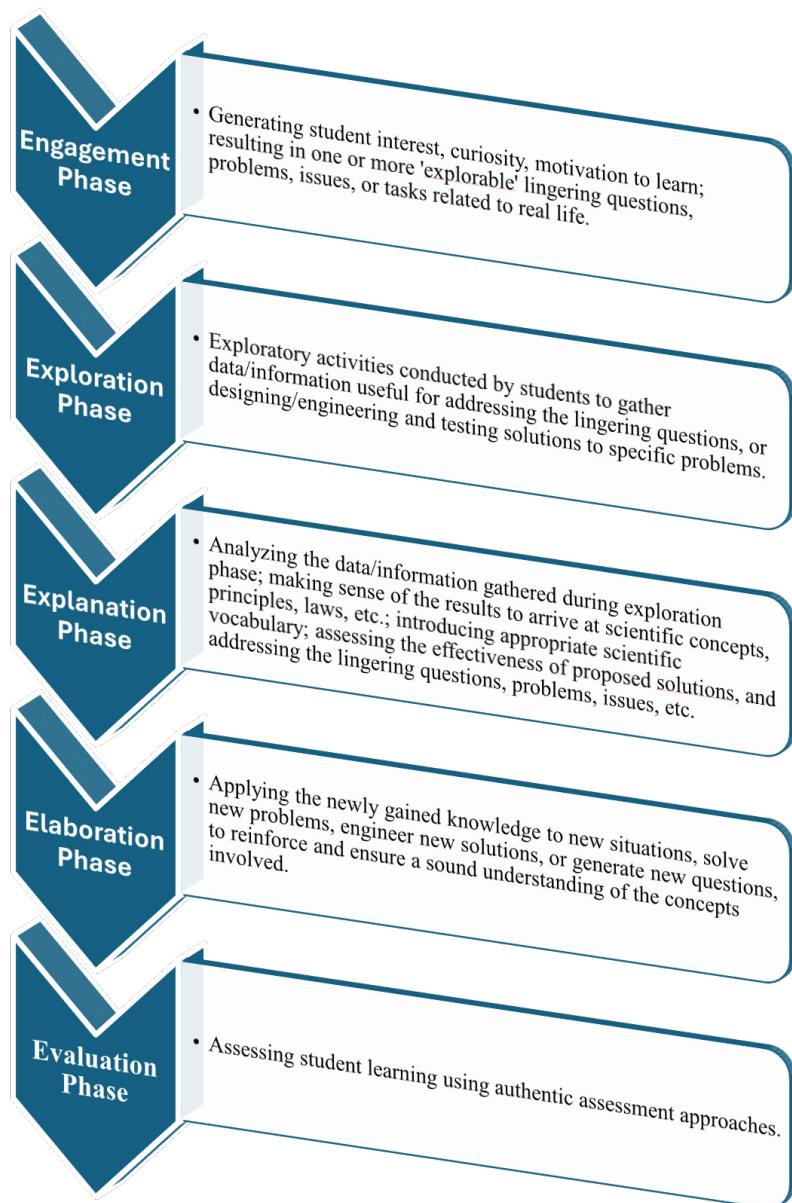
A Response to the Challenge

The author worked in just such a program for 13 years, during which he taught the lone ‘methods’ course for middle and secondary PSTs. Realizing the challenge identified above, he designed his ‘methods’ course around the 5E Model of the Learning Cycle Approach (Bybee et al, 2006), in such a way that the students experienced the 5E Model throughout the course activities all semester long. The premise behind this course design was that by the end of the course, the PSTs would have first-hand experience of the potential of the 5E Model in delivering “effective” science instruction and would have developed a sound understanding of the elements of the 5E Model. Thus, they will become equipped with an initial “pedagogical capital” for immediate use in their own classrooms to implement 3-Dimensional science instruction. Similar attempts to use the 5E Model and the Learning Cycle Approach in science teaching methods courses have been made and reported in recent years (Bradbury, 2017; Hick, 2017). These reports focus on student ability to write a Learning Cycle based Lesson Plan and to reflect on the teaching episodes. However, the mindset of students regarding the elements of effective science instruction, a mindset that they would carry with them into the profession and their classrooms, was not explicitly examined. Thus, the existing literature documents PSTs’ “skill” development in writing Learning Cycle based lesson plans and reflecting on their implementation during the “methods” course. It does not, however, provide any documentation of the impact of this skill development on their dispositions and mindset regarding effective science instruction. Herein, lies the research gap being addressed by the study reported here.

Table 1: Alignment between the phases of the Learning Cycle and Scientific & Engineering Practices

Phases of the 5E Model of the Learning Cycle (A pedagogical approach for effective science instruction)	Essential Scientific & Engineering Practices (One of the THREE Dimensions presented in <i>A Framework for K-12 Science Education</i> , 2012)
ENGAGEMENT	Asking Questions Defining Problems
EXPLORATION	Developing & Using Models Devising Testable Hypotheses Planning & Carrying out Investigations Collecting, Analyzing and Interpreting Data Using Mathematics & Computational Thinking
EXPLANATION	Analyzing and Interpreting Data Constructing Explanations and Critiquing Arguments based on Evidence Designing Solutions Communicating and Interpreting Scientific Information
ELABORATION	Applying and Using STEM Knowledge
EVALUATION	Applying and Using STEM Knowledge

Figure 1: The 5E Model of the Learning Cycle



Considering the importance of "practice" in teacher preparation and making this practice authentic, the author implemented two levels of practice within this course: having PSTs practice the phases of the 5E model within the 'methods' course where the audience was their course peers; and developing and teaching a 5E model-based science lesson in a local school classroom. Each of these levels of practice were followed by reflective analyses of the teaching episodes by the presenters as well as the course peers who were the audience (in case of presentations within the 'methods' class) and observers (in case of lessons taught in the school classrooms). These reflective analyses were both verbal during 'methods' class sessions and written after each teaching 'practice' episode. The 'methods' course was offered each Fall (Autumn) and Spring semester for a 15-week duration.

The impact of practice-based learning experiences coupled with reflection in this 'methods' course designed around the 5E Model, on shifts in PSTs mindset regarding effective science instruction, was examined via a free-response essay. PSTs were asked to respond to the question, "*How should science be taught?*" in this essay, given as a pre- and post-test. The pre-test was given on the first day of class prior to commencing any learning activities. The post-test was given on the last day of class. This pre- and post-test essay represents a "meta-reflection" expressing the PSTs mindset at the beginning and end of the course. The comparison of the pre-test essay response to the post-test essay response demonstrates the cumulative impact of multiple teaching practice episodes followed by reflection on those episodes throughout the 'methods' course.

The research question being explored and addressed in this study is: To what extent do the reflective, practice-based course level experiences lead to a shift in PSTs' mindset regarding key elements of effective science instruction?

Theoretical Foundation

The theoretical foundation of reflective practice employed in this 'methods' course is based on Lisle's (2006) conception of reflective practice, which characterizes reflective practice in education as "learning-in-practice". PSTs in this 'methods' course were indeed learning in practice since throughout the course they were engaged multiple times in the practice of teaching using the 5E Model and then reflecting in a systematic way

on how that practice represented elements of effective science instruction and in what ways could their practice be improved to better incorporate those elements. This reflective approach was very similar to the one designed by Belvis et al (2013) for a mathematics teacher education program in which teachers reflected on their own educational practices and then shared among colleagues and in small groups.

A review of 120 publications, representing an international body of literature, conducted by Jensen, Georgsen, and Dau (2023) concluded that the concepts of reflection, practice, and theory are interconnected and the combined experience of all three is essential for developing deep meaningful learning that impacts the professional lives of people. In the case of science teacher education example reported here, the theory was the 5E Model of Learning Cycle, the practice was designing and implementing 5E-based lessons in school classrooms, and then structured reflection on each teaching episode of these lessons. The combined experience of these three —reflection, practice, and theory—in this teaching methods course was expected to impact the mindset of the PSTs toward implementing effective science instruction congruent with the 3-Dimensional Framework described earlier. This impact was investigated using the "meta-reflection" approach via the pre- and post- essays.

Reflective practice has the capacity to transform instruction (Parsons and Stephenson, 2005). In the case of pre-service teacher education, the first step in the transformation of instruction is a change of mindset. Specific to science instruction, most PSTs' recent experience of science instruction comes from their college science classes. For the most part, these classes use didactic, lecture style method of content delivery, coupled with "cook-book" recipe style laboratory exercises. For learning about elements of effective school science instruction, PSTs need to experience, practice, and reflect upon specific pedagogical approaches, such as the 5E Model. Learning and experiencing such approaches can be expected to develop the "pedagogical capital" PSTs need in order to deliver effective science instruction and accomplish the current goals 3-Dimensional learning in science. With this expectation, the impact of such practice-based reflective learning experiences on PSTs mindset (toward transformation of instruction) must then be assessed. That assessment was performed via the pre- and post- meta-reflective essay in this 'methods' course.

Methodology

Data regarding change in PSTs' mindset were collected through this pre- and post- essay each semester from Fall (Autumn) 2007 through Spring 2013. Data from only those PSTs who wrote both the pre- and post- essay were included in the analysis, since it is essential to have both the pre- and post- essay from a PST in order to examine any change in their mindset. Collectively between Fall 2007 and Spring 2013, a total of 85 PSTs submitted both pre- and post- essays. Thus, the results presented below show the impact of the reflective, practice-based learning experiences in this methods course on 85 PSTs.

The essays were analyzed first by using qualitative comparison of the narrative in pre- and post- essays for themes that indicate student ideas regarding ways of teaching science effectively. Ideas that showed connection to or alluded to specific components of *Scientific and Engineering Practices* of the 3-Dimensional framework, or comments that referred more generally to inquiry-oriented, hands-on type instruction, were coded broadly as 'elements of effective science instruction'. Next, a quantitative approach was taken to record the number of times such ideas or comments appeared in a PST's pre- and post-essay. The number of times these ideas appeared in the pre-essay was compared with the number of times similar ideas appeared in that PST's post-essay. This comparison provided a measure of the degree to which PSTs mindset was impacted by the reflective, practice-based learning experiences in this science teaching methods course.

Results of the Response (Findings)

In general, the results of these analyses indicate shifts in PSTs' understanding of the elements of effective science instruction from didactic, information-imparting features, to more interactive, hands-on/minds-on, features. The following are some specific instances demonstrating change in the mindset of PSTs between the pre- and post- essay.

1. 5 E's were mentioned much more frequently in the post- essays, but never in the pre- essays.

2. PSTs are more focused on the content (disciplinary core ideas) in the pre- essays. They have ideas on ways to structure and organize the content they would teach, but not on methods to do that. The post- essays show greater focus on demonstrations, labs, and interactions among the students, as methods of learning.
3. Most PSTs indicated only brief familiarity with the concept of hands-on learning in the pre- essays but provided much more detailed account of how to implement hands-on/minds-on learning, in the post- essay.
4. In many of the post- essays, the PSTs wrote about wanting to help students take responsibility for their own learning and they want the students to discover their own answers without being told through a lecture.
5. Most PSTs discussed how hands-on experiences are more important and lasting than lectures and memorization, in their post- essays but not in the pre- essays.
6. There was a significant focus on questioning things and letting questions guide the class lessons, in the post- essays compared to pre- essays.
7. The pre- essays of some PSTs are more focused on content and teaching it in understandable and simple ways. The post- essays of these PSTs focused more on student engagement and how to get them to discover things for themselves.
8. Many of the pre- essays mentioned engaging students or having experimentation. But, they didn't describe concrete methods on how to engage students. Elaboration of the methods to do so showed up in the post- essays.
9. In the pre- essays, many PSTs wrote about teaching enthusiastically, but not how to do this. In the post- essays, they didn't say this directly, yet their descriptions included ideas, which, if implemented, would result in an enthusiastic teaching environment.

10. Most PSTs used the term 'inquiry' in the post- essay, but not in the pre- essay. Instead, the pre- essay refers to the concept as "hands-on".
11. The idea of not just memorizing and regurgitating the material comes up a lot. Instead, PSTs mention connecting science to the real world, so students can apply their knowledge.
12. To truly understand information, you need to be involved in it, not just merely memorize facts. Many PSTs mention the 5 E's as a good way to help students understand and get involved in science, in their post- essays.
13. Many PSTs mention interactive activities to get students interested, in their post- essays but not in their pre- essays.
14. Some PSTs mentioned vocabulary terms or particular content in the pre- essay but it wasn't mentioned at all in the post- essay. Rather, the post- essays included a greater focus on how to get the students actually doing science.

Samples of student statements in the pre- and post- essays, shown in Table 2, demonstrate the change in their mindset about elements of effective science instruction and corroborate some of the summary findings listed above. The *highlighted* statements in the post- essay column represent direct connection to parts of the *Scientific and Engineering Practices* dimension, which characterize effective science instruction.

Table 2: Sample statements demonstrating mindset shift from pre- to post-essay

Student	Pre- Essay	Post- Essay
1	<p><i>The best way to teach science is to let the kids experience it first-hand, and get to do experiments. Should also be relatable to their lives.</i></p>	<p><i>Science should be taught the way it is performed, by asking questions and designing a way to answer it. It must be relatable to their lives. Hands-on is good but it will only work if it is also minds-on.</i></p>
2	<p><i>To engage students in science you must be enthusiastic Hands-on experiments are important but you need some lecture or reading to be able to understand what is happening.</i></p>	<p><i>To teach science you need to make it relevant to the students' lives. Then students should be able to explore and ask questions. She then walks through the rest of the 5 E's which encourages student involvement.</i></p>
3	<p><i>Science should be taught using experiments and labs since that is how real science is done. Students learn better when they actively participate, and small group work can help with this.</i></p>	<p><i>Students should be doing science not just hearing about it. Activities should be hands-on and minds-on. There should be situations where students can ask questions and discover their own answers rather than just following a procedure.</i></p>
4	<p><i>Science should be taught by asking questions and letting them investigate through hands-on activities. But some background information should be given first.</i></p>	<p><i>Science should be taught by letting the students do experiments and the teacher should only give information after the students have had a chance to look at it themselves. Discussion is important and will interest and motivate students. Also, it should be connected to things students interact with in their lives.</i></p>
5	<p><i>Science should be taught as something that everyone is capable of, and we should use everyday examples to encourage students. This will help them make connections between the content and their lives.</i></p>	<p><i>Science should be taught through scientific inquiry. This allows students to ask questions, discuss, experiment, analyze/collect data, make predictions etc. The 5 E's help students learn through hands-on and minds-on. The teacher should be a guide rather than the ultimate giver of info. Also, we need to connect things to students lives.</i></p>

Significance of the Results

It is important to point out that this work was conducted in the context of the *National Science Education Standards* (National Research Council, 1996), prior to the publication and widespread impact of the *Framework* (National Research Council, 2012). The Framework ushered a new 3-Dimensional approach to the teaching and learning of science, which has become widely accepted and being implemented across the USA. Thus, it is appropriate to raise the question whether or not the results of the work presented here are still relevant for the post-*Framework* era of science education.

When the results presented above are examined carefully, it becomes obvious that the PSTs were impacted positively regarding the importance of elements of science instruction that feature within the *Scientific and Engineering Practices* dimension of the *Framework*. These include ideas such as students being given the opportunity to ask questions, make predictions, collect and analyze data, etc. Thus, it can be argued that the 5E model of the Learning Cycle does hold promise for helping pre-service teachers realize the importance of incorporating the *Scientific and Engineering Practices* in their science instruction. Indeed, specific '*Practices*' map well onto specific phases of the 5E model (Dass, 2015). This makes the 5E model a useful tool for equipping pre-service teachers with an initial "pedagogical capital" for implementing 3-Dimensional science instruction, envisioned in the *Framework*. It is, therefore, useful to have pre-service teachers experience the 5E model of the Learning Cycle, as thoroughly as possible, during their science teaching methods courses. It is even more important to couple the 5E model with reflective, practice-based learning experiences during these courses in order to effect a mindset shift toward effective science instruction.

Conclusions

The purpose behind using the 5E Model and a reflective, practice-based approach in this 'methods' course was twofold.

- To develop a mindset about effective science instruction in PSTs.
- To provide the "pedagogical capital" to PSTs to implement effective science instruction in their own classrooms.

The comparison and analyses of their pre- and post- meta-reflective essays, indicate that both goals have been met to a significant extent. These results also support the idea posited by Parsons and Stephenson (2005) that reflective practice has the capacity to transform instruction. However, what was assessed in this 'methods' course was only the first step of the transformation of instruction, namely the transformation of mindset. To what extent did this transformation of mindset result in actual transformation of instruction in these PSTs classrooms after they graduated from the program has not been examined. This is a limitation of the work being reported here and warrants further investigation.

Finally, it is reasonable to claim that multiple episodes of teaching practice, each followed by systematic reflection, can have a cumulative effect of transformation of the mindset toward effective instructional practices and this transformation of the mindset can be assessed via a meta-reflective essay.

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Exploring Reflective Practice-Based Learning Through Game-Based Design

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Abstract

This study examines *DidakTekQuest*, a board game designed to enhance Continuing Professional Development (CPD) for in-service educators by integrating Game-Based Learning (GBL) with Reflective Practice-based Learning (RPL). Framed within a design-based research methodology, the paper analyses the game's intended design to explore how it can cultivate collaboration, dialogue and reflection to promote in-service educators' understanding of digital technology in their teaching practices. Drawing on theoretical frameworks including the concept of double stimulation, the study demonstrates how game elements can stimulate agency, dialogue and pedagogical exploration. The results highlight the potential of game-based learning to stimulate reflective dialogue and critical thinking that enable educators to meaningfully incorporate digital tools into their teaching practices.

Keywords

Reflective Practice-based Learning, Game-Based Learning, Continuing Professional Development, Educational design, Digital technology

Introduction

In general, the continuous professional development (CPD) of in-service educators faces significant challenges, particularly in the areas of reflection, motivation, and bridging the theory-practice gap (Iqbal & Ali, 2024, Näykki, Kontturi, Seppänen, Impiö & Järvelä, 2021). In this paper, we address some of the common challenges in CPD with a particular focus on in-service educators' development of technological literacy and

motivation for applying digital technology in their teaching practices at three educational institutions in Denmark.

The paper is based on a research and development project conducted in collaboration between researchers and IT-consultants from X, Y and Z during 2023–2024. The aim of the project has been to develop a new approach in the form of a board game to continuing professional development (CPD) for in-service educators using a design-based research framework (Design-Based Research Collective, 2003). The DBR approach emphasizes the iterative development of educational solutions that are both grounded in theory and tailored to address the practical challenges educators encounter in their teaching practice by focusing on collaboration, reflection and dialogue between researchers and participants. The paper examines the theoretical and pedagogical choices underpinning the board game, with the purpose of providing a foundation for future empirical investigations of its implementation and effects.

A dialogical and reflective approach aligns well with Reflective Practice-based Learning (RPL) as presented by Horn et al. (2020) by embedding reflection into the learning process, fostering deeper critical thinking. It enhances intrinsic motivation by connecting learning to educators' real-world experiences, making professional development more relevant. Additionally, RPL bridges the theory-practice gap through a dialectical approach, encouraging participants to apply theory to practice and reflect on outcomes, thus making professional development more practical and meaningful. Further, research shows that Game-based Learning and a gamified approach similarly can increase motivation, active participation, and retention of knowledge and learning – also among adult learners (Ness et al., 2024). Gamification means that game mechanics (e.g., points, time, and rules) are applied in contexts that typically have nothing to do with games (Plass, Homer & Kinzer, 2015) – in this case CPD.

Based on the assumption that a professional and social game around IT-didactics and technological literacy could increase educators' motivation and active learning, as well as inspire them to use digital technologies in their teaching practices, we developed and tested a board game, as part of the project. The paper seeks to answer the following research question:

How can a board game be designed to cultivate collaboration, dialogue and reflection to promote in-service educators' understanding of digital technology in their teaching practices?

State-of-the-art

As mentioned, the goal of the project was to address some of the common challenges in CPD and develop a new game-based approach that might mitigate some of the challenges. In the following, we elaborate on some of the well-known challenges and how focusing on both reflection and gamification as core concepts in our alternative CPD design, was contemplated.

Challenges in CPD

Several challenges related to CPD of in-service educators can be identified, particularly concerning reflection, motivation, and the theory-practice gap (Iqbal & Ali, 2024, Näykki et al., 2021). Challenges related to reflection include limited time for reflection, lack of structured reflection and superficial reflection. Challenges related to motivation are typically concerned with external motivation factors, misalignment with personal goals and issues of autonomy and control. Finally, challenges related to the theory-practice gap often concern a disconnection from practical needs, lack of practical examples and ineffective content delivery (Ayvaz-Tuncel & Çobanoğlu, 2018).

Consequently, the CPD of in-service educators is hindered by several interrelated challenges, which we needed to take into consideration in designing our board game. For reflection to be meaningful, time and structured opportunities are essential. Motivation suffers when CPD activities do not align with personal goals or provide sufficient autonomy. Lastly, bridging the theory-practice gap remains a key concern, as many activities typically focus on theory without offering practical applications relevant to the educators' day-to-day experiences.

Theoretical grounding

To contextualise the design of *DidakTekQuest*, this section outlines the theoretical foundations underpinning the project. Specifically, it draws on frameworks from Game-Based Learning (GBL), Reflective Prac-

tice-based Learning (RPL), and the concept of double stimulation to inform the game's pedagogical approach.

Game-Based Learning as alternative approach to CPD

Regarding the professional development of educators, literature reviews have examined educators' perception on available support on specific game usage or to shift teachers' perceptions of GBL (Meredith, 2016), perception change of GBL in teachers for improving GBL implementation, teachers own use of their professional time, and the act of balancing fun and learning (Springle, 2024), what principles facilitate effective GBL in classes (Kucher, 2021), and teachers' perception of using GBL, and what the requirements of training courses for teachers on GBL are (Ragni et al., 2023). While there currently exists studies applying a combination of GBL in CPD context, these studies are almost exclusively applying CPD to change the perception of teachers to become more favorable towards using GBL in their own teaching (An, 2018; Palha & Jukić, 2023) Thereby, a current gap in literature, is the lack of GBL in CPD for in-service teachers not to improve GBL use but rather for improving teachers' general teaching competencies and reflection.

Reflective Practiced-Based Learning as alternative approach to CPD

Horn et al. (2020) have proposed RPL as a novel approach while acknowledging the influence of previous theoretical approaches, particularly pragmatism and experiential learning theories (e.g., Dewey, Kolb, Schön) that emphasize many similar features such as reflection, the integration of theory and practice, and experiential learning. According to Horn et al. (2020), the novelty stems from positioning RPL as a cohesive, structured pedagogical framework that systematically incorporates these elements in a way that differentiates it from previous approaches. In RPL, reflection is incorporated into every phase of learning, linking theory to practice in a continuous loop, theory and practice are viewed as mutually dependent, continuously informing one another in a more dynamic and integrated way than traditional experiential learning models. RPL further emphasizes the importance of interaction and dialogue between students and educators, as well as among peers, to co-construct meaning and deepen reflective practices. Finally, RPL offers six pedagogical principles tailored to professional educational contexts and suggests

scaffolding through these principles (Horn et al., 2020). The principles are discussed further below as they inform the analysis of the board game.

While previous research into the adaptation of RPL predominantly has focused on students' learning i.e. in university colleges (Georgsen, Dau & Horn, 2023), in our view, this approach also has merits in CPD – cf. with regards to reflection and the importance of interaction and dialogue between peers.

Integrating GBL and RPL

Several studies have shown that combining GBL with RPL can enhance learning, competence development, and motivation, though the two approaches differ in scope and context. In health education, the simulation game *The Ward* improved reflective thinking by fostering teamwork, self-awareness, and decision-making in small-group clinical scenarios (Açıl & Keçeci, 2024), while the *Person-Centred Care Game* promoted values-based competencies through structured reflection in patient interaction (Wallengren et al., 2023). In secondary education, reflection diaries have helped students connect gameplay with subject-specific content (Baßeng & Budke, 2024), and digital GBL environments incorporating prompts and performance feedback increased motivation, problem-solving, and self-awareness among young adult learners (Shaheen & Fotaris, 2023). Although the benefits of combining GBL and RPL are well-documented, no studies have been identified applying the approach of GBL and RPL within a CPD context.

Double stimulation

Relevant to our discussion of the intended design of DidakTekQuest is the cultural-historical activity theory concept of *double stimulation* (Vygotsky, 1994; Sannino, 2015). Traditionally used as an experimental method to investigate higher mental functions, double stimulation is increasingly interpreted not only as a method, but as a principle of *volitional action* that underlies human capacity for self-regulation, agency, and purposeful transformation of behavior (Vygotsky, 1994; Sannino, 2015).

Double stimulation occurs when a subject is confronted with a *primary stimulus* – typically a difficult or ambiguous situation – and is then offered or actively constructs a *second stimulus*, often a symbolic or material artifact, to mediate and reorganise their response. According to Sannino (2015), this process entails not just cognitive reorganization,

but the mobilization of agency through conflictual motives, allowing individuals to make conscious, volitional decisions.

Methodology

To investigate the research question, this study explores the intended design of the board game DidakTekQuest, as conceptualised by the research and development team, which includes the authors of this paper alongside other contributors. The exploration is based on an analysis of game elements and activities (Hanghøj, 2023) through different theoretical lenses i.e. GBL and RPL. Further, we apply the concept of 'double stimulation' to illustrate how both GBL and RPL merge in the intended design.

Following van den Akker's (2003) framework, educational design can be understood across three interconnected levels comprising the intended, implemented and realised design. The intended design includes e.g. the pedagogical goals, theoretical rationale, and guiding design principles articulated by the designers. The implemented design concerns how these ideas are interpreted, adjusted and enacted by educators in real-world contexts. The realised design refers to the learners' actual experiences and outcomes as observed in practice.

This study specifically centres on the intended design to gain insight into the underlying educational intentions embedded in the board game and to examine how the board game was purposefully structured to support reflective practice and technology integration. By focusing on this level, we aim to understand the theoretical and pedagogical choices that shaped the game's development, as a foundation for future empirical investigations of its implementation and effects.

The analysis is guided by an analytical framework that draws on two complementary lenses: (1) Game-Based Learning (GBL), which provides criteria for assessing how game elements support learning processes, and (2) Reflective Practice-based Learning (RPL), which offers a pedagogical perspective for evaluating how the design facilitates critical reflection and professional growth among educators.

The intended design: DidakTekQuest

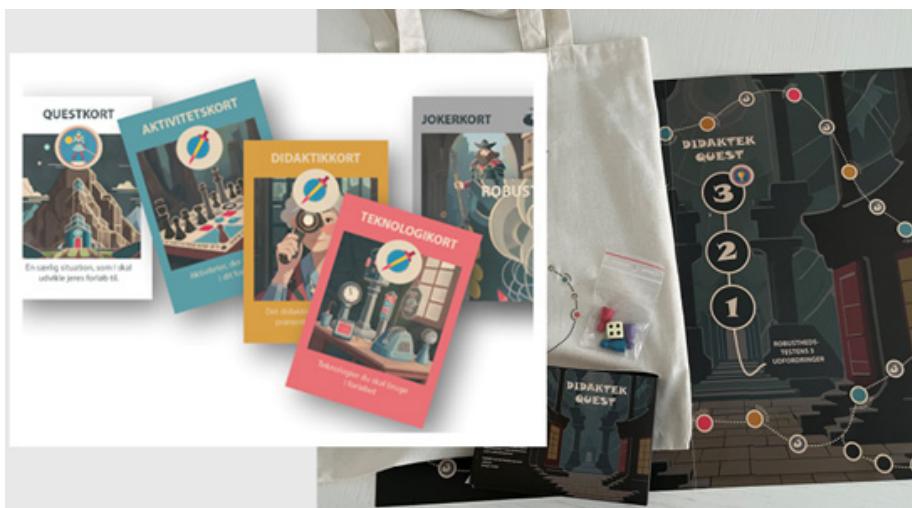
DidakTekQuest is an educational game designed to promote educators' digital competencies through collaborative, scenario-based learning. As a key element of the design, participants play with physical dice, cards and bricks on a board. Participants play in groups, each developing their own didactic design while collectively addressing a shared instructional constraint.

At the outset, the group selects a Quest Card introducing a teaching scenario that must be integrated into all designs. To develop their designs, players collect three types of Clue Cards:

- Activity Cards (blue): Instructional strategies and learning activities
- Didactics Cards (yellow): Pedagogical theories and frameworks
- Technology Cards (red): Digital tools and considerations

Each player must collect two cards of each type. If a player lands on a *Joker Card*, an unforeseen challenge is introduced. Once a player has successfully gathered six Clue Cards, they proceed to the *Robustness Test*, which evaluates the strength and adaptability of their didactic design. The player who performs best in this test is declared the winner.

Figure 1: The playing cards, bricks, dice, and board developed for the DidakTekQuest game

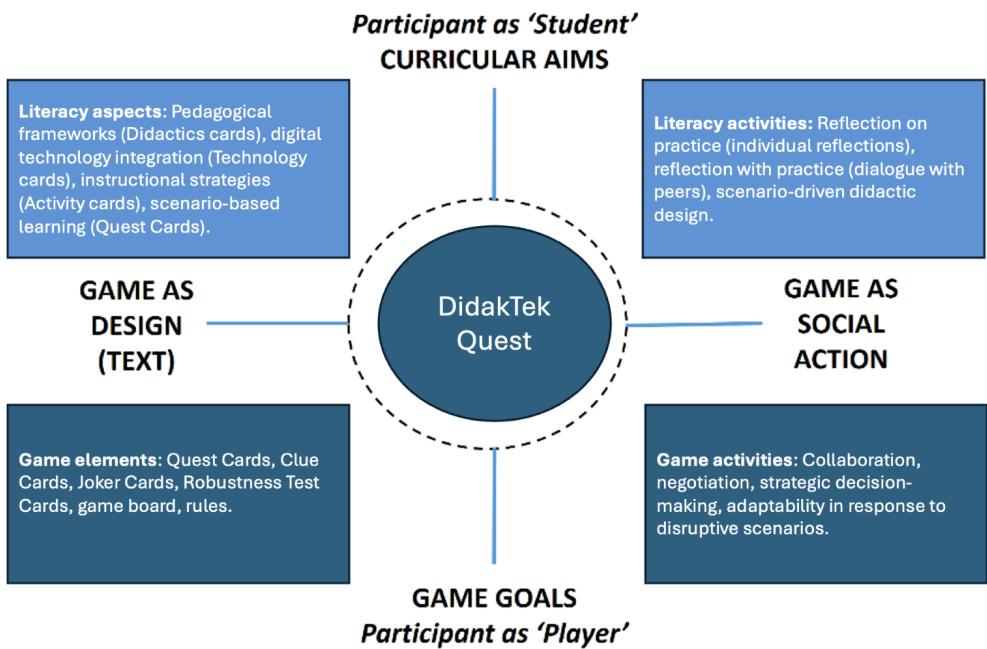


GBL as analytic lens

Definitions of both game-based learning and gamification vary widely in the literature, meaning that there is a plethora of approaches and foundations for design. According to Plass, Homer & Kinzer (2015), game designers use behaviourist elements, cognitivist elements, and constructivist elements, and often various combinations of them. In our work, we have been inspired by educational game researcher, Hanghøj (2023, 2022), who has proposed a theoretical and analytical model called the Game as Educational Challenge (GEC) model to examine how teachers pedagogically can frame game challenges and facilitate classroom dialogues around game experiences. Central to the GEC-model is identifying game challenges and linking them with educational aims. The GEC-model consists of two intersecting dimensions. A vertical dimension that focuses on linking game goals (engaging challenges form within the game) with curricular aims (specific learning objectives form the curriculum). A horizontal dimension that emphasizes game interactions as both texts/design (game mechanics) and social actions (e.g. promoting collaborative interactions, communication, and activities inside or around the game). These dimensions intersect to form four aspects game designers must consider.

In figure 2, we have adopted the GEC-model by Hanghøj (2022, p.11) to the DidakTekQuest game design:

Figure 2: The GEC-model applied on the DidakTekQuest



According to Hanghøj (2022, 2023) game elements and activities are central to determining the game's central purpose and design. Therefore, in the analysis and discussion of the board game (below), we choose to focus exclusively on game elements and game activities to illustrate how a game can supplement RPL.

RPL as analytical lens

To explore the pedagogical intentions embedded in the intended design of DidakTekQuest, this study draws on the core principles of Reflective Practice-Based Learning (RPL) as formulated by Horn et al. (2020). RPL provides a theoretical and pedagogical foundation for understanding how reflection can be purposefully structured and facilitated within professional learning environments. By applying these principles as an analytical lens, we aim to analyse how the game design aligns with established strategies for fostering meaningful professional development among in-service educators. The six principles are as follows:

1. Incorporating students' own experiences: Encouraging learners to draw on their prior knowledge and professional contexts as a foundation for reflection.
2. Designing teaching and learning activities to include appropriate disturbances: Introducing challenges or tensions that disrupt routine thinking and prompt deeper engagement.
3. Organising teaching and learning activities as exploration: Framing learning as an open-ended process of inquiry and discovery.
4. Using good examples as the basis for teaching and learning: Providing relevant, high-quality models or scenarios that stimulate analysis and adaptation.
5. Fostering collaboration between lecturers and students: Promoting co-construction of knowledge through dialogue and joint activity.
6. Creating room for dialogue: Ensuring space for open, critical, and reflective conversations as part of the learning process.

Analysis of the boardgame

Applying the RPL principles in a teaching resource analysis we have identified the different game elements of DidakTekQuest as presented in both the previous section and table 1. In regard to the GEC-model, the game elements have been included as the representative part of the board game.

Table 1: Matching how game elements clearly align (X) or indirectly align ([X]) with the RPL principles

RPL principle/ Game elements	Principle 1 Incorporating students' own experiences	Principle 2 Designing teaching and learning activities to include appropriate disturbances	Principle 3 Organising teaching and learning activities as exploration	Principle 4 Using good examples as the basis for teaching and learning	Principle 5 Fostering collaboration between lecturers and students	Principle 6 Creating room for dialogue
Clue cards (Activity-, Didactic, and Technology cards)	X	[X]	[X]	X	[X]	[X]
Joker card	X	X	[X]			
Robustness test	[X]	X			X	
Game board			X			
Co-player		[X]		X	X	X
Quest card	[X]	[X]				
Rules			X	[X]		

Besides the application of Horn et al.'s (2020) six principles of reflective practice-based learning, the analysis is further enriched by the double stimulation of Vygotsky (Sannino, 2015). This allows us to interpret the game not only as reflective dialogue, but as interactions shaped through encounters with pedagogical tensions and the use of mediating tools.

Cards as reflective game elements

To design and develop their resilient didactic designs through *Didak-TekQuest*, educators draw on their prior experiences in teaching and didactic designing. These experiences are revisited, explored, and re-eval-

uated to inform deliberate value-based decisions in their choices (Boud et al., 1996). The quest cards initiate this reflective process by offering a common scenario that all participants must address, thereby creating a shared foundation for collaboration while also preserving the individuality of each educator's context and expertise.

This highlights the dual function of the game to support individual introspection and collective meaning-making. In this regard, *Didak-TekQuest* fulfills Principle 1 of Horn et al. (2020), as educators actively integrate their professional experiences into the game, engaging in *reflection-on-action* while designing didactics (Schön, 1983).

The game elements of clue, quest, joker and robustness test cards together facilitate a dynamic reflective process. The disruptions introduced by the *joker* and *robustness test* cards function as intentional disturbances that challenge the educators' assumptions and promote a deeper inquiry of didactic design. In doing so, the aforementioned cards directly support Principle 2, as the game itself acts as a pedagogical scaffold that enables educators to relate reflectively to their teaching subject. These moments of breakdown and re-interpretation also fulfill Principle 3, which emphasizes exploration as a means of re-establishing meaning in complex learning situations.

Moreover, the game supports Principle 4 through the interplay of personal experience and exemplary practice. Rather than separating these categories, the game invites educators to use their own teaching as a point of entry for generating shared, generalizable insights. As educators draw on and discuss *Activity*, *Didactics*, and *Technology* cards, they expose implicit strategies and conceptual frameworks that can be analyzed and shared. The game design encourages educators not only to describe what they want to do, but to interrogate why and how they would like to do it, inviting not only themselves to develop upon the didactic design but also their co-players.

Players as reflective partners

While *DidakTekQuest* contains competitive elements—such as the pursuit of the most robust didactic design—it is fundamentally structured around collaboration. Players are positioned as reflective partners who co-construct understanding through mutual dialogue, feedback, and scenario negotiation. This is particularly evident in their interactions around the quest cards, shared challenges, and evaluative phases of the

game which underlines the game's departure from traditional competitive formats toward one of cooperative inquiry and shared reflection.

As educators build their own didactic designs, they are simultaneously required to integrate a *common quest card* scenario. This mutual constraint necessitates ongoing dialogue and co-construction of pedagogical meaning. In this way, the game design reinforces Principle 2, not through instructor-led instruction, but by embedding pedagogical scaffolding directly into peer interactions and shared constraints. The game becomes a kind of “more knowledgeable other,” guiding players through structured, peer-mediated reflection (Horn et al., 2020).

The *joker* and *robustness test* cards, as previously mentioned, introduce unforeseen disruptions, which, in the case of the dialogic nature of DidakTekQuest, invite collaborative exploration and dialogic interpretation. These moments exemplify Principle 3, where the breakdown of initial meaning opens up space for new insights and richer understanding. Educators work through ambiguity together, using peer feedback to develop more robust, adaptable didactic designs. This not only underlines the game as a social action but also aligns with Principle 5, which frames learning as a socially mediated phenomenon. The game's mechanics create a space where educators rely on each other to progress, through mutual feedback and deliberation during the *robustness test*, and the shift in roles as one educator is chosen as the *Game Master*. Rather than being adversaries, educators act as collaborators, challenging each other to deepen their understanding of effective pedagogy.

Finally, the concluding phase of the game exemplifies Principle 6, which emphasizes dialogue, feedback, and feedforward as bridges between learning and teaching. In the robustness test, the Game Master facilitates an open-ended evaluation process where didactic designs are assessed not against fixed standards, but for their pedagogical soundness and adaptability within real-world constraints. This dialogic engagement fosters reflective insight, not only into one's own design but into the design decisions of peers. It also reframes the idea of “winning” the game, since success is less about individual achievement and more about the quality of reflection and shared learning.

Discussion and conclusion

This study has aimed to evaluate a game-based CPD teaching resource – DidakTekQuest – for in-service educators to address long-standing challenges in professional development: particularly in terms of collaboration, dialogue and reflective practice. The analysis presented underscores the potential of the board game as a resource in CPD, but its implications extend beyond immediate usability. This discussion explores the theoretical and practical implications of the analysis by situating the findings in relation to wider discourses in reflective RPL and GBL with special focus on how the board game mediates volitional learning and teacher agency.

Reframing professional development through double stimulation

The concept of double stimulation, as introduced in the theory section, offers a valuable lens for understanding the pedagogical intentions of DidakTekQuest. By placing players in complex teaching scenarios and offering them conceptual resources to address these challenges, the game is designed to activate volitional action within a collaborative learning environment. Through the use of quest and joker cards as primary stimuli- representing demanding teaching situations – DidakTekQuest initiates reflective engagement by eliciting cognitive and emotional dissonance. These disturbances function not simply as pedagogical tasks, but as catalysts that stimulate educators' intrinsic motivation to work through authentic dilemmas.

In turn, the Clue and Robustness Test cards serve as second stimuli, providing conceptual and semiotic resources – such as pedagogical frameworks, instructional strategies, and digital tools – that players can draw upon to reframe and reorganise their responses to the initial constraints. This process closely aligns with the volitional dynamics described by Sannino (2015), wherein individuals engage in conscious, transformative action. As educators interact with these tools within the structured yet imaginative space of the game, they are not only engaged in problem-solving but also actively reshaping their professional identities and capacities.

Importantly, this dynamic is not merely cognitive – it is *agentive*. Educators move beyond compliance or external motivation and into zones

of intentionality, where decision-making is guided by professional values, contextual needs and pedagogical reasoning. Thus, DidakTekQuest goes beyond merely scaffolding reflective practice; it aims to actively stimulate it through mediated volitional engagement. Consequently, the game has the potential to serve as a space for expansive learning, where constraints become catalysts for educational transformation and collaboration.

Dialogical learning and situated reflection

The design of DidakTekQuest exemplifies a shift from individualized CPD models toward *collective reflection* and *dialogical meaning-making*. This aligns with Horn et al.'s (2020) principles of Reflective Practice-based Learning (RPL), especially the emphasis on dialogue, disturbance, and exploration. The inclusion of structured dialogue—through shared scenarios, feedback loops, and evaluative discussions—supports knowledge co-construction among educators. Rather than merely reflecting on their own teaching, players engage in a mutually constituted reflective process, offering and receiving peer insights that challenge assumptions and promote metacognition.

As noted by Kyndt et al. (2016) and Geeraerts, Tynjälä and Heikkinen (2018), professional learning is often most powerful when embedded in socially mediated environments that support feedback, collaboration, and shared inquiry. DidakTekQuest effectively positions peer engagement as both a means and an outcome of learning. The collaborative aspect is not a by-product; it is integral to the educational function of the game, enabling a communal redefinition of pedagogical practices.

Implications for CPD and future research

This study suggests that blending gamification and reflection is not only possible but mutually reinforcing. The design of DidakTekQuest demonstrates that gamified CPD can remain pedagogically rigorous while fostering collaboration, dialogue and reflection. Nonetheless, questions remain about the effectiveness of the game, especially regarding sustained changes in teaching practice and technological adoption. Future research might investigate how repeated use of DidakTekQuest influences educators' planning habits, collaboration patterns and digital literacy. Longitudinal studies could provide deeper insight into whether reflective habits

developed through gameplay extend into educators' daily routines and institutional cultures.

Additionally, the principle of double stimulation offers fertile ground for further exploration in CPD. As Sannino (2015) argues, this principle provides a lens not only for understanding reflective processes but also for designing environments that catalyse them. By framing game design as an intervention in educators' volitional development, we may begin to construct more agency-centered CPD environments that align better with professional identity, autonomy and real-world complexity.

It should be acknowledged that the present work is limited by its conceptual scope and the absence of systematic empirical testing. Further studies, both qualitative and quantitative, are needed to validate these propositions, identify contextual constraints, and explore how such interventions perform in practice over time.

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The Role of Disruptive Technologies in Shaping Reflective Practice-Based Learning: Insights from AI and Ethical Considerations

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Abstract

The release of OpenAI's ChatGPT in 2022 marked a new era in AI-supported education, bringing to light both the potential benefits and challenges of using AI-driven tools like chatbots in learning environments. Concerns surrounding shallow learning and potential misuse of AI have made educators cautious about integrating such tools in their teaching. This article examines how AI, particularly in academic work, can foster deeper exploration and engagement, drawing on Hannah Arendt's theories on "the human condition" to frame these insights. Using a case study that includes screenshots and transcribed dialogues from students' interactions with ChatGPT in written assignments, this study analyzes data from approximately 100 third-year students. In response to a rapidly evolving digital landscape, the study considers the role of disruptive technologies like AI in reflective practice-based learning (RPL) and the importance of technological literacy for both education and professional practice. By situating AI within Arendt's *vita activa* and *vita contemplativa* frameworks, we explore how AI can enhance exploration and thus support RPL. Further, the article addresses ethical concerns around AI, investigating the balance between enhancing academic integrity and fostering exploration in an AI-influenced environment. Ultimately, this study contributes to discussions about the future of RPL, considering the implications of AI and other emerging technologies for educational practices. The findings aim to inform the development of pedagogical frameworks that integrate technological literacy and reflective practices,

providing a foundation for understanding the ethical and practical considerations essential for future research and implementation.

Keywords

Generativ AI, Reflective Practice-based Learning (RPL), exploration, Inquiry, Higher education

Introduction

When ChatGPT was released by OpenAI in 2022, it didn't just introduce a new tool, it cracked open an entirely new chapter in the story of education. Within weeks, classrooms and lecture halls around the world were grappling with a profound question: is this the future of learning, or its undoing? The promises and threats of generative AI (GenAI) were no longer abstract, they were present, practical, and pressing (Haleem et al., 2022; Sharma & Yadav, 2022). As the dust settled, a deep divide emerged among educators and institutions: should GenAI be embraced as a powerful ally for educational innovation, or approached with caution as a potential disruptor of reflection, exploration, and authentic learning? (Sharma & Yadav, 2022; Kasneci et al., 2023; Tlili et al., 2023). As GenAI gains ground in teaching and changes the way knowledge is produced and processed, new demands thus arise for both educators and students. These demands are not limited to technological competencies, but also include judgment, reflection, and ethical awareness (Upadhyaya & Vrinda, 2021; Rosa, 2021). Students increasingly need to evaluate the reliability and relevance of information and understand their own role in the interplay between human and machine thinking.

In higher education these developments and dilemmas of GenAI challenges some of the fundamental pedagogical principles that have traditionally underpinned teaching and learning. Here, education is often rooted in a pedagogical practice where the goal is not only the acquisition of knowledge but also the development of professional judgment, critical reflection, and the capacity to act in complex, practice-based situations (Dewey, 1938, Horn, Pedersen & Georgsen, 2021). In this context, *reflective practice-based learning* (RPL) has gained ground as a central pedagogical understanding. A key element in this approach is the concept of *exploration*. Exploration involves giving students the opportunity to investigate, experiment, and create knowledge through a process

characterized by curiosity and openness. It presupposes a learning environment that supports uncertainty and complexity, in which the student actively participates in creating meaning through personal inquiry and learning trajectories (Jensen, 2021).

When teaching is designed with exploration as a central principle, students are invited to adopt an investigative stance, where they do not merely receive knowledge but co-construct it through an open and inquisitive process. This is especially critical as GenAI now threatens to bypass inquiry-driven processes with pre-formulated answers (Sharma & Yadav, 2022; Kasneci et al., 2023; Tlili et al., 2023). When AI tools offer easy and quick solutions that resemble complete answers, the student risk shortening the exploratory process and give the illusion of understanding without actual insight. Instead of engaging actively in the learning process, students may be tempted to accept AI-generated responses as authoritative, which can lead to superficial learning and reduce their opportunity to develop independent judgment.

Moreover, AI challenges our understanding of what it means to truly learn something. If the tool provides the text, structure, and argumentation, it becomes unclear what cognitive and epistemic processes the student has engaged in. This makes it difficult to assess the learning outcome and to maintain a learning approach grounded in personal experience, inquiry, and reflection (Jensen, 2021). Therefore, pedagogy must not only focus on learning as a result but as a process in which curiosity, critical thinking, and judgment are cultivated in interplay with new technologies (Dewey, 1938). This requires carefully designed pedagogical frameworks and a deliberate pedagogical practice, where AI is used as a *tool within* the inquiry process, not as a shortcut *around* it. For these reasons, it becomes essential to investigate how teaching and supervision can be structured so that AI is integrated in ways that support, rather than undermine, exploration, reflection, and professional judgment.

This article examines the role of GenAI in education through the lens of Hannah Arendt's distinction between *vita activa* and *vita contemplativa* (Arendt, 1958; 1963; 2005). Arendt's perspectives enable a deeper analysis of the student's position in an accelerated, technological reality where judgment, responsibility, and meaning making become central learning goals. At the same time, Arendt's concepts are related to Dewey's understanding of inquiry as the driving force of learning, thereby highlighting how AI can potentially both support and undermine ex-

ploratory practices. By examining how technological assistance influences students' opportunities for independent inquiry, the article aims to contribute to the development of pedagogical frameworks that both integrate AI and preserve exploration as a core value in professional education. This article thus seeks to address the following research question

How does the integration of AI within teacher-designed activities influence the depth of inquiry-based exploration in reflective practice-based learning contexts?

To better understand how AI influences inquiry-driven learning processes and the development of professional judgment, it is necessary to frame exploration not only as a pedagogical strategy but also as a human activity grounded in broader philosophical and educational traditions. In the following section, we turn to Hannah Arendt's concepts of *vita activa* and *vita contemplativa* to explore how thinking (contemplation) and acting (engagement) can be understood in relation to students' exploratory practices. These concepts provide a lens through which to examine how GenAI intervenes in the balance between reflection and action, and what is at stake when learning risks being reduced to automated outputs. Arendt's thinking will thus serve as a theoretical foundation for analysing how AI shapes the conditions for inquiry-based exploration in current-day education.

Theoretical Framework

To understand how GenAI interacts with inquiry-based learning, it is essential to approach *exploration* not merely as a method, but as a dynamic learning orientation characterized by a willingness to follow unexpected lines of thought and action through iterative processes. This dual orientation makes Hannah Arendt's distinction between *vita activa* and *vita contemplativa* a compelling framework for examining how exploration unfolds in educational settings shaped by digital technologies such as AI. Thus, exploration lives between these two modes as being simultaneously active and contemplative, requiring both doing and thinking in the learning process. It thus involves navigating uncertainty, working with ambiguity, and constructing knowledge through movement between experience and reflection.

Exploration between acting and thinking

Exploration can be seen as a movement between two fundamental human capacities: the capacity to act and the capacity to think. These are not opposing modes, but mutually dependent elements of how learners engage with the world. Arendt conceptualizes them as *vita activa* (the active life) and *vita contemplative* (the contemplative life) (Arendt, 1958). While these have often been treated as separate spheres in philosophical traditions, Arendt argues for their interrelation, particularly in the context of education.

Vita activa, in Arendt's thinking, refers broadly to the human capacity to act in the world (Arendt, 1958; Arendt, 2005). It is through action that individuals reveal themselves, form relationships, and participate in shaping a shared reality. In educational settings, exploration often takes place through this kind of action, when students collaborate, experiment with ideas, or express emerging understandings through dialogue with peers and teachers (Arendt, 2005; Yarbrough & Stern, 1981). Exploration, in this sense, is not a solitary process but one grounded in interaction, participation, and the unfolding of thought through engagement. *Vita activa*, with its emphasis on human action and engagement in the world, corresponds closely with RPL's focus on practice and real-world activity (. RPL stresses the importance of incorporating students' own experiences and of designing learning activities rooted in authentic professional contexts. This reflects Arendt's view that action is a way in which individuals participate in and shape their shared world. In an educational setting, *vita activa* aligns with exploratory learning activities that involve collaboration, discussion, experimentation, and dialogue that require students to articulate and defend their thinking. These are forms of action that invite students to test ideas, co-construct knowledge, and respond to real-world complexity (Biesta, 2010; Biesta 2012; Arendt, 2005)

Such activities position students as active participants rather than passive recipients of information. AI tools may support this mode by assisting in generating ideas or organizing content. However, if overused, they risk weakening the active dimension of learning, especially when students begin to rely on automation rather than their own contributions.

In contrast, *vita contemplativa* refers to the thoughtful life of the mind, encompassing reflection, understanding, and meaning making. This contemplative mode is equally essential for exploration, as it allows

learners to pause, reconsider, reframe, and make sense of their experiences (Biesta, 2010; Biesta 2012; Arendt, 2005). Thinking, for Arendt, is not aimed at producing immediate results; rather, it is a condition for judgment and the formation of perspective. In learning, it is what enables students to hold space for complexity and resist premature closure. Likewise, *vita contemplativa*, which centers on reflection and thought, resonates with RPL's emphasis on reflection as a vital part of the learning process. RPL highlights the need for students not only to act, but also to reflect on their actions to develop professional judgment. This reflective process is essential in connecting theory to practice, which is a core aim of RPL (Horn, Pedersen & Georgsen, 2021). This corresponds to Arendt's perspective on *vita contemplativa* which refers to the process of thought, where individuals step back from immediate activity to reflect, make sense of experiences, and seek understanding. In educational contexts, this mode is present in learning activities that support deeper reflection, conceptual exploration, and the development of perspective. These activities could include reflective writing, where students examine their assumptions and choices, or individual reading and inquiry tasks that require focused engagement with complex ideas. It can also involve journaling, concept mapping, or analytical assignments that ask students to synthesize viewpoints or evaluate ideas critically (Biesta, 2010; Biesta 2012; Arendt, 2005). These contemplative practices are essential for exploration because they allow students to remain with uncertainty, explore nuance, and gradually form their own understandings (Arendt, 2005; Yarbrough, & Stern, 1981; Dau & Nielsby, 2021). AI can support this dimension by providing feedback, analytical assistance, or access to diverse perspectives. However, when students rely uncritically on AI-generated content, there is a risk that the depth of learning is compromised, as the essential processes of interpretation and reflection may be overlooked.

AI can support exploratory engagement by prompting new questions, suggesting alternative perspectives, or offering immediate responses that encourage additional learning trajectories. Yet it also carries the risk of interrupting both the student's active involvement in the learning process and the reflective moments that allow understanding to deepen and consolidate. When AI-generated responses are treated as complete or unquestionable, exploration may collapse into a mechanical exchange between prompt and output, leaving limited space for uncertainty, inter-

pretation, or the construction of meaning (Arendt, 2005; Yarbrough, & Stern, 1981). Thus, the introduction of AI in education has implications for how students learn and participate. When exploration is compressed by the polished surface of AI-generated content, the possibilities for ongoing inquiry and thoughtful engagement are reduced. The dynamic movement between acting and thinking, central to Arendt's understanding of human learning and agency, might be disrupted. As a result, students may find it more difficult to maintain an investigative position in their work and risk becoming passive recipients rather than active participants in knowledge creation.

Exploration in education is not a single type of activity, but a learning orientation that unfolds through a variety of practices, some rooted in action and others in reflection (Dewey 1938, Jensen, 2021). Arendt's distinction between *vita activa* and *vita contemplativa* provides a valuable lens for understanding the different kinds of learning activities that can support exploratory engagement. The distinction between *vita activa* and *vita contemplativa* clarifies that learning is not only about acquiring knowledge but about becoming someone who can act in the world and think about it. By framing exploration through Arendt, the pedagogical question is not simply whether students use AI, but how their use of AI can coexist with meaningful opportunities for inquiry. Are they given the opportunities and incitement to act, to reflect, and to make sense? Or is it possible for the student to choose shortcuts that bypass the slow, uncertain work of learning through their use of AI?

Arendt's framework thus provides a way of asking what kinds of human engagement are sustained or displaced when AI enters the learning process. In the following analysis, we examine how students engage in exploratory processes when working with AI tools. Drawing on student reflection data and examples of teacher-designed activities, we investigate how the conditions for exploration are shaped by the interplay between human inquiry and technological assistance.

Research design

The study addresses the research question through a case study conducted within the Bachelor of Architectural Technology and Construction Management program at UCN. The case focuses on students in the third semester, who have used GenAI (ChatGPT, Co-pilot, Primo Research

Assistant) as part of their work on an academic assignment. The case study specifically centres on a teaching sequence where the students work with a profession-related topic of their own choice, allowing them to deepen their expertise within that domain. Students were given the freedom to use AI in their assignments, with the requirement that they submit a reflective report describing how they integrated AI into their academic work. In addition, teachers maintained an ongoing dialogue with students about how to work with AI in a constructive and appropriate manner. The overall aim was for students to take independent responsibility for their professional and methodological development by engaging with research-based knowledge in one or more relevant subject areas.

Insider position

A recurring concern in educational research relates to the researcher's positionality, specifically the dynamics between being an insider or outsider in the field (Herr & Anderson, 2015). An insider researcher brings direct experience and familiarity with the context under investigation, which can provide unique access to tacit knowledge and complex dynamics that may otherwise remain hidden. This situated knowledge can be especially valuable in practice-oriented studies, as it enables the researcher to identify tensions and contradictions within the field (Brinkmann & Tanggaard, 2010). Rather than viewing objectivity as detachment or neutrality, scholars such as Skjervheim argue that such ideals can risk freezing the complexity of lived realities (Nielsen & Nielsen, 2006). Similarly, Dewey rejects the notion that knowledge emerges from passive observation. Instead, knowledge is formed through participation and transformation of situations (Tashakkori & Teddlie, 2010). While many studies emphasize the researcher's individual position, it may be even more productive to explore how the interplay between insider and outsider perspectives contributes to knowledge generation. Milligan (2014) highlights the potential of a flexible and responsive research position, in which power relations and roles between researchers and participants are acknowledged as part of the knowledge construction process. By purposefully combining multiple positions within a research design, the study can benefit from varied perspectives and foster richer insights (Brinkmann & Tanggaard, 2010; Milligan, 2014). Nonetheless, insider research is not without criticism. Given the traditional emphasis on ob-

jectivity in research, this critique is important to acknowledge. However, when addressed with transparency and humility, issues of bias can be constructively managed through reflexivity and critical self-awareness (Herr & Anderson, 2015).

This study employs a collaborative research approach that incorporates both insider and outsider perspectives. Two researchers have also acted as teachers within the context being studied, contributing in-depth understanding of the professional field. This perspective allowed for identification of subtle patterns and dynamics in the teaching practice. The third researcher maintained a more external position, offering analytical distance and a critical lens that helped challenge assumptions and deepen the analysis. The interplay between these positions created a productive tension, enabling the research team to reflect critically on their roles and the relational dynamics between researchers and participants. The integration of insider knowledge and outsider distance has not only enhanced the credibility of the findings but also contributed to a more layered and nuanced understanding of the teaching practices under investigation.

Datacollection

The selected case can be considered paradigmatic in the sense that it illustrates a learning environment in which students engage with GenAI as a support tool in their academic writing process (Flyvbjerg, 2006). The choice to focus on students from the Architectural Technology and Construction Management program is based on their familiarity with digital tools and their ability to articulate and reflect on their technological experiences. This has contributed to a more nuanced insight into how GenAI is used in practice.

The case study draws on multiple sources of data (triangulation), which strengthens its analytical depth and credibility. Data collection focused on capturing students' reflective experiences, thoughts, and impressions while working with GenAI in the context of an academic assignment. Data were collected in the form of Initial observations conducted during classroom sessions and Reflective exams report. Furthermore, screenshots documenting students' actual interactions (prompts and responses) with GenAI were included in the students' final exam submissions as part of their process descriptions in the final Reflective exams report. In total, 25 groups of 4–5 students' Reflective exams report were included

in the study. To ensure transparency, all students were informed from the outset that their teacher would also act as a researcher and that the integration of AI in the course would be observed as part of a research project. This clarification was intended to ensure openness about the research process and to help students understand the framework for their participation.

To further protect voluntary participation, written informed consent was collected after the completion of the final exams, specifically regarding the use of screenshots and other submitted data. This timing was chosen to avoid any influence on the students' approach to their work that might arise from knowing it could be used for research purposes. The goal was to ensure that the students' work reflected an authentic learning process. Throughout the research process, anonymity and confidentiality were maintained. All data, including AI interaction screenshots, were treated confidentially, and identifying information was removed during analysis and reporting. After the exam, students were given the opportunity to ask questions and provide consent for their participation in the study.

The analysis aimed to identify and categorize patterns, themes, and concepts that shed light on the role of student's use of GenAI in an academic writing process (Boyatzis, 1998; Saldaña, 2016). The coding process drew on written student reflections, and accompanying screenshots from their documented work processes. The initial coding was conducted by one of the researchers who had the insider knowledge of the educational context. These categories were then further developed through reflective dialogue between both researchers. While the potential for bias due to the insider's dual role was acknowledged, efforts were made to mitigate this through continuous critical engagement with the data from both insider and outsider perspectives.

The inclusion of screenshots from the students' reflective reports in the analysis below, is not intended to allow the reader to access or interpret the specific written content of, for example, individual post-it notes or annotations. Rather, the screenshots serve an illustrative and documentary purpose. They offer a visual indication of the scope, volume, and complexity of the students' work—providing a concrete sign of the time, effort, and iterative engagement they have invested in their academic process. The images function as representations of the exploratory journey, showing how students used tools such as Miro boards or

physical clustering to externalize, organize, and refine their thinking. As such, they reflect not only the structure and dynamics of their inquiry process but also the pedagogical design that supports reflective practice and academic exploration.

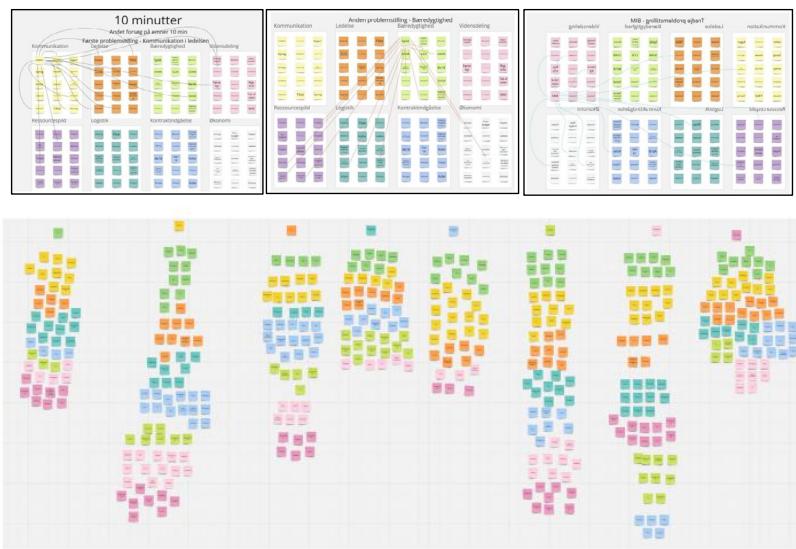
Analysis

This study set out to explore how the integration of GenAI interacts with inquiry-driven and explorative learning in reflective practice-based learning environments. The findings indicate that AI can serve as a powerful resource in student learning processes, but only when embedded in pedagogically intentional designs that scaffold exploration, dialogue, and reflection.

AI as a companion in the Inquiry Process

Many students describe the initial stages of their work as disorienting, marked by uncertainty about how to define the problem or connect ideas into a coherent whole. This lack of structure becomes a catalyst for action-oriented methods such as brainstorming, mind maps, brainstorming, and digital platforms such as Miro. As one group noted: “By combining the creative and open process of brainstorming with the visual and structured approach of mindmaps, we have ensured that our problem delimitation is precise and well-considered.” Here, tools act as mediators between exploratory action and reflective insight. They enable a transition from the openness of idea generation to the clarity of problem formulation (see fig. 1).

Figure 1: Student brainstorm illustrating the collaborative generation of ideas. The image serves as a visual sign of process, scope, and effort rather than detailed content



The tools scaffold both the *acting* and the *thinking and* are most powerful when embedded in pedagogical designs that promote iteration, discussion, and critical engagement. In several cases, students describe how AI helped them explore new perspectives or refine their problem focus. Used strategically during brainstorming, AI tools became a partner in their processes of inquiry, offering suggestions, clarifying definitions, and even proposing keywords or search terms. The student reflections show how GenAI tools, had a multifaceted role in shaping their academic work. While students used AI to support various tasks, from brainstorming and structuring to editing and research, the reflections also reveal a growing awareness of the need for critical distance, collaborative verification, and personal accountability. AI was not used passively. Instead, students navigated its potential and limitations as part of an emerging digital literacy and inquiry-based learning practice. This type of use reflects Arendt's *vita activa* where AI is not just a tool for individual cognition, but a participant in an exploratory dialogue that fuels collective learning. The learning is not delivered, but co-constructed through interaction, prompting, and contextualization.

AI as a Bridge Between Data, Language, and Learning

In line with the theoretical framework of academic exploration and Dewey's principle of inquiry, the students' reflections reveal that the literature search process was not merely a mechanical task but an exploratory, iterative, and sometimes frustrating journey that contributed meaningfully to the formation of knowledge. A recurring strategy employed by the students involved initial broad searches followed by gradual refinement, mirroring Dewey's model of hypothesis testing and revision. As one student noted, *"In the initial phase, we searched broadly on the topic of sustainability, each of us individually, to uncover relevant literature and identify potential problem areas."* This openness in the initial phase reflects an experimental mindset and a readiness to allow the material itself to shape emerging questions. Several groups used structured frameworks such as search protocols (see fig 2) and Mindmaps with grouped keywords into thematic search categories (see fig 3) to document their strategies and track progress. One group stated, *"The search results were then compiled into a shared search protocol to ensure a systematic approach to our search process."* The use of search protocols represents a form of reflective practice that allowed for meta-cognitive awareness of the inquiry process, knowing what has been tried and what to try next.

Figure 2: Excerpt from students' search protocol illustrating their use of Boolean operators (AND, OR, NOT) to structure and refine their literature search strategy across multiple databases

Google scholar	(Sustainable in construction* OR Processes* OR Respect* OR Circular* OR "Competence development" OR Methods* OR Prerequisites* OR "Meeting management" OR Urbanization* OR Lifetime* OR Reuse* OR DGNB*) AND (Technology in Danish construction* OR innovation* OR AI OR Patience* OR Health* OR Processes* OR Interest* OR "Efficiency improvement") AND (Globalization* OR Consequences* OR Strengths* OR Weaknesses* OR Investment* OR Communication*)	I alt: 18.800 Refleksjon: Her er søgt på 3 blokke. For at præcisere "sustainable" er der indsat construction.	05-02-2025
Google scholar	(Conflict management* OR Transition OR Perspectives OR Communication plan/Pyramid OR Reflection OR Feedback OR Responsibility OR Culture OR Solution-oriented OR Conflict escalation model OR Guidelines OR Motivation OR Collaboration) AND (Organization* OR Welfare* OR Coordination* OR Hierarchy* OR "Decision-making group" OR Facilitation* OR Co-creation OR "Growth plan" OR "Internal role distribution")	I alt: 19.300 Refleksjon: efter nye ord kommer der flere hits. 2 blokke	05-02-2025
Proquest	(Conflict management* OR Transition OR Perspectives OR Communication plan/Pyramid OR Reflection OR Feedback OR Responsibility OR Culture OR Solution-oriented OR Conflict escalation model OR Guidelines OR Motivation OR Collaboration) (Organization* OR Welfare* OR Coordination* OR Hierarchy* OR "Decision-making group" OR Facilitation* OR Co-creation OR "Growth plan" OR "Internal role distribution")	I alt: 1.252 Refleksjon: fravælt Scholarly journals og i perioden 2020-2029	05-02-2025

Figure 3: Organized brainstorm showing how students grouped keywords into thematic search categories to guide their literature search



The role of AI in supporting these processes was multifaceted. Students reported using ChatGPT and other AI tools to suggest search terms, translate keywords, generate synonyms, and summarize abstracts. Other students highlighted the value of AI in validating and contextualizing sources. For instance, *“We asked AI to suggest synonyms for ‘time’ during our brainstorming. This has been a great help when searching for concepts and theories.”* Here, AI becomes integrated into the inquiry cycle, providing both clarification and conceptual expansion. Despite technological assistance, students remained aware of the need for human judgment. Peer review status, author credentials, and publication context were commonly used criteria for source selection. As one student group explained, *“We evaluated the search results based on titles, abstracts, and keywords, and we compared different sources to ensure that the information was consistent and supported by other credible sources.”* This emphasis on source critique reinforces the critical dimension of academic exploration.

This aligns closely with Hannah Arendt's conception of *Vita activa*. Arendt emphasizes that human action is fundamentally dialogical and situated in a web of relations. In the students' collaborative efforts to construct mindmaps, revising search terms based on shared experiences, and discussing the meaning and implications of their findings, we see a clear enactment of this plurality. As one group described, "*We took our keywords from the brainstorm and Mindmap and combined them, and we discussed why and what made the different sources relevant...*" While these collaborative and action-oriented activities reflect the dialogical nature of *vita activa*, the students' literature search processes equally engaged them in moments of *vita contemplativa*. In Arendt's terms, *vita contemplativa* refers to the inward, reflective activity of thought which is

the mode where students withdraw from action to pause, question, and make meaning. This contemplative dimension was evident in how students evaluated the relevance and credibility of their sources, compared differing perspectives, and adjusted their focus based on new insights. One group described how they “We read abstracts and conclusions to ensure that the articles were relevant to our research question” a practice that illustrates the movement from information gathering to thoughtful deliberation. Similarly, when students used AI to clarify complex terminology or rephrase search terms, they were not just optimizing efficiency but deepening their conceptual understanding. In this way, the interplay between *vita activa* and *vita contemplativa* underpinned the students’ engagement with literature, allowing both collaborative experimentation and solitary reflection to inform their academic exploration.

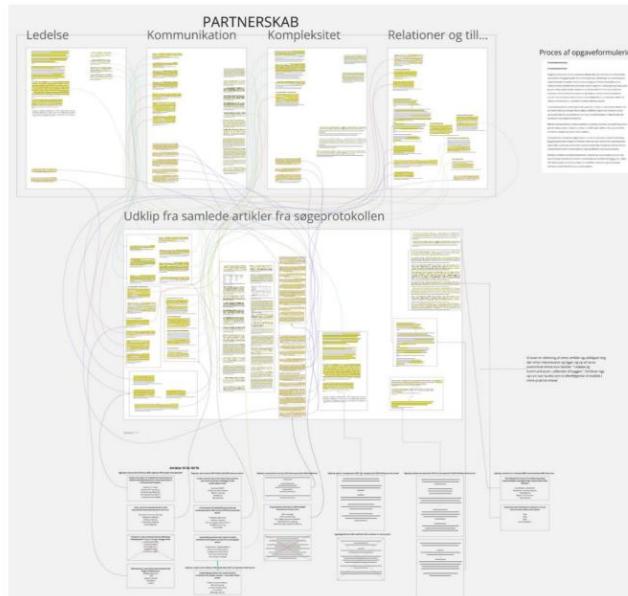
Coding as Structured Inquiry

Students described how they worked with coding strategies to navigate large amounts of data, particularly research articles. Through sorting, clustering, and categorizing (see fig 4), they developed analytical frameworks that allowed refinement of their understanding and clearer problem definitions. A Group described how they: “*We read through each individual quote and grouped them according to the topic of the quote, which made it possible to identify more specific themes to form the basis for our problem descriptions.*” This process reflects the iterative character of exploratory learning, where students return to the data not just to extract meaning but to construct a meaningful framework through discussion, comparison, and judgment.

These are classic elements of inquiry-based learning but here grounded in collective action and academic practice. Here, the interplay of *vita activa* (negotiation, re-categorization) and *vita contemplativa* (assessing meaning, considering alternatives) is evident. These moments demonstrate that categorization is not merely about data organization, it is an epistemic practice where judgment is exercised and developed. AI was often used as a supplementary partner in the coding and structuring process. Students fed categorized quotes into AI tool to help them generate coherent sections of text or problem formulations. Thus, they were using the AI tool not as a decision-maker, but as a reflective sparring partner. As one group noted: “*We inserted them into ChatGPT and had it help us create a consolidated problem statement based on the text excerpts*

divided into categories." This use of AI suggests that students are learning to position the technology as a means of enhancing their academic action, rather than bypassing it.

Figure 4: Visual overview of students' coding process, illustrating the depth of their analytical work through clustering and categorizing literature, even if individual labels are not legible



Conclusion

This study has examined how students engage with GenAI tools within a pedagogical framework rooted in reflective practice-based learning. By integrating Hannah Arendt's concepts of *vita activa* and *vita contemplativa* with Dewey's notion of inquiry, the research illuminates how exploration unfolds as both a cognitive and social activity. This duality could be described as an interplay of action and reflection as seen in Reflective practice-based learning. The findings show that when AI is embedded in thoughtfully designed learning environments, it can enhance rather than diminish inquiry-driven learning. Students leveraged AI to brain-

storm, structure, search, code, and articulate their ideas, often treating it as a dialogical partner rather than a shortcut to ready-made answers.

By applying Hannah Arendt's distinction between *vita activa* and *vita contemplativa*, the study has shown that exploration unfolds as a dynamic movement between acting and thinking. The students' engagement with GenAI was not a replacement for this movement, but in many cases a catalyst within it. AI supported action-oriented processes when used in group-based brainstorming, iterative problem formulation, and collaborative coding strategies. These practices resonate with Arendt's understanding of *vita activa* as participation in a shared world. AI can support this mode when it is used to enhance action, for example by organizing ideas or facilitating new lines of inquiry. At the same time, students engaged with AI in ways that nurtured *vita contemplativa*, especially when they used group dialogue to interpret, and reflect critically on their sources and arguments. AI can assist here in synthesizing information or offering alternative perspectives, but only when students remain the ones doing the thinking.

These forms of engagement were not passive or linear but exploratory and open-ended. Students returned to their data, reformulated their questions, and allowed new perspectives to emerge. In doing so, they exercised judgment and cultivated the ability to act meaningfully in complex learning situations.

Overall, this study demonstrates that GenAI neither guarantees nor prevents meaningful exploration. Its role is shaped by how it is used, and by whether pedagogical frameworks encourage students to engage both actively and reflectively. Arendt's distinction between *vita activa* and *vita contemplativa* helps clarify how education must offer students opportunities not only to act in the world of knowledge but also to think about it. When AI is embedded in teaching in ways that support this balance, it can become part of a richer, more meaningful learning process rather than a shortcut around it. Thus, the study suggests that GenAI can support exploratory learning when it is situated within pedagogical frameworks that preserve the balance between action and reflection.

However, this potential is not automatic. The study also highlights how uncritical or excessive reliance on AI may risk reducing the depth and authenticity of learning. The core of exploratory education lies in uncertainty, negotiation, and meaning making. These are not processes that can be outsourced to technology; they require human engagement,

relational dialogue, and reflective judgment. Ultimately, the integration of AI in higher education must be guided by a clear pedagogical purpose aiming at fostering student judgement through reflective practices and collaborative actions. Educators must therefore continue to ask not just whether students use AI, but how they are invited to think and act with it.

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Triggering Reflection Through Ecotones: The Role of GenAI Vignettes

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Abstract

In the post-digital educational landscape, it is increasingly essential to understand how students develop professional judgements about technology. This study explores how students from Social Education, Health Administration and Coordination, and Digital Concept Development programs reflect on technology-mediated dilemmas using a GenAI vignette. The vignette presented an ethically complex scenario designed to prompt critical reflection. A total of 95 students participated in collaborative writing reflection tasks, and selected students from each program participated in focus group interviews. Drawing on Dewey's and Rodgers' theories of reflection, the analysis shows that the students' responses were shaped by their professional orientation: social education students emphasized relational ethics, health administration students focused on regulation and implementation, and digital design students approached the scenario through usability and innovation. The findings suggest that GenAI vignettes can foster critical reflection on technology's role in professional practice, supporting the development of ethically aware, reflective professionals. This method shows promise for preparing students to navigate digitally mediated work environments.

Keywords

Ecotones, Post-Digital, GenAI, Reflective Practice Learning, RPL, Deliberate Professionals

Introduction

Digital transformation has fundamentally reshaped professional practices across sectors. Technology no longer serves as a mere supplement to human interaction; it increasingly acts as a mediating and transformative force in decision-making processes and everyday professional actions. This development raises critical questions about how students prepare for professional practices where technology is an integrated part of both professional judgement and action. Therefore, technological literacy has emerged as a key competence that goes beyond technical know-how to include critical reflection, ethical judgement, and an understanding of how technology shapes individuals, societies, and professional fields. According to Wallace (2011), technological literacy entails the ability to use, manage, assess, and understand technology, as well as to reflect on its implications for individuals, society, and the environment. This critical, multidimensional approach to technology is essential for navigating the increasing complexity of technological integration and for preparing students and professionals to make informed and reflective decisions in practice.

Reflective practice learning (RPL) plays a central role in fostering technological literacy. As Horn et al. (2020) argue, reflective practice involves an ongoing dialogue between action and reflection, where professionals continuously engage with and learn from complex, often unpredictable situations. Reflection enables students to identify both the opportunities and limitations of technologies, allowing them to make ethically informed professional decisions. However, several studies have shown that the presence of reflective activities in curricula does not necessarily lead to genuine or meaningful reflection (Røise, 2024). When tasks such as reflective writing, portfolios, or structured feedback are mandatory, students may approach them with an instrumental mindset. In such cases, reflection becomes a performative exercise focused on fulfilling assessment criteria, rather than an opportunity for deep learning and critical thinking (Brown et al., 2013; de la Croix & Veen, 2018). This is a challenge even for students who are engaged in fieldwork or internships, as practical experience alone does not guarantee that reflection will occur or lead to professional insight (Røise, 2024).

Research suggests that authentic reflection often requires an initiating experience, often referred to as a trigger – typically an emotionally en-

gaging or ethically complex situation that disrupts routine expectations and stimulates critical inquiry (Bagheri et al., 2019). Although real-life practice can offer these situations, they are not always recognized as reflective opportunities. For this reason, designed interventions may be needed to create shared and intentional spaces for reflection. Simulated scenarios, such as vignettes, can replicate or amplify the complexity and ambiguity of real-world dilemmas, making ethical and professional tensions more visible and discussable (Schuler, 2021). In educational settings where academic work complements practical training, such triggers can strengthen the connection between lived experience and reflective engagement. They offer structured entry points for students to explore their own judgement, consider alternative perspectives, and discuss the implications of professional decision-making. Moreover, research has also highlighted the importance of a conducive environment – one that allows autonomy, encourages interaction, and supports students in understanding the relevance of reflective practice (Marshall et al., 2021; Butani et al., 2017).

Professional judgement, as conceptualized by Trede and Jackson (2021), further highlights the role of reflection in professional life. They introduce the concept of the deliberate professional – someone who purposefully integrates reflection with ethical reasoning to navigate professional complexity. From this perspective, reflection is not only an individual cognitive act but also a situated practice that bridges values, judgement, and action. When linked to technological literacy, this form of reflection supports professionals in making balanced decisions in digitally mediated environments. The aim of this study is to investigate how students' professional judgement is influenced and shaped through reflective engagement with digital technology. More specifically, we explore how GenAI vignettes can act as reflection triggers that support authentic reflection across different professional education programs. To frame this investigation, we now turn to the theoretical foundations of reflection, ecotones, and professional judgement.

Reflection as a Process for Developing Professional Judgement in Technological Ecotones

Although previous research has explored how professional judgement is shaped in the intersection of technology and practice, less attention has been paid to the reflective processes that enable this judgement to

emerge. We address this gap by focusing on how reflection, as conceptualized by Dewey (1963, 2005), enables students to develop professional judgement in technological contexts. According to Dewey, reflection is a systematic and experiential process that is triggered by problematic situations – situations where existing routines are disrupted and new responses must be explored. Reflection thus becomes a pragmatic process of inquiry, allowing students to transform complex encounters with technology into professional learning and judgement. To actively trigger reflection on technology and professional judgement, we used a GenAI vignette, where students encounter a scenario blending technological, ethical, and professional dilemmas. This type of reflection trigger is supported by recent research emphasizing the importance of emotionally engaging and ethically challenging situations for promoting authentic reflection in higher education (López-Cuello, 2024). By placing students in a simulated but realistic professional dilemma, the vignette facilitates reflection on technology's role in professional judgement.

Thus, this article explores how students reflect on technology-mediated professional dilemmas and how these reflections contribute to the development of professional judgement. Our approach is based on the understanding that reflection is not merely a personal process but rather a socially and professionally situated activity that is essential for navigating the complex spaces where technology, ethics, and professional practice intersect. We pose the following research question: *How is students' professional judgement influenced and shaped through reflective engagement with digital technology?*

This article draws on both empirical and theoretical perspectives to examine how students from design, healthcare, and social education programs experience and reflect on technology within their education, as well as how these reflections influence their ability to make informed and ethically grounded decisions in professional practice. Through this analysis, we aim to contribute new insights into the relationship between technological literacy, reflection, and professional judgement and to shed light on how reflection can be purposefully facilitated in professional education using technology-mediated reflection triggers such as GenAI vignettes.

In the following section, we present the theoretical framework for this study, focusing on the intersection of reflection, ecotones, and professional judgement.

Theory

In contemporary professional education, students are increasingly required to navigate hybrid spaces where the digital and the analogue are deeply intertwined. These environments cannot be understood through traditional dichotomies such as digital versus analogue or virtual versus actual. Instead, they represent complex, interwoven networks where material, digital, social, and political dimensions coexist and interact.

To capture this complexity, Ryberg et al. (2021) introduce the concept of ecotones. This was originally a term from ecology referring to transitional zones between two ecosystems, such as the area between a forest and a grassland. In the context of education, ecotones describe zones where digital and analogue elements merge, generating overlapping characteristics and new forms of interaction, interpretation, and identity that are not present in either domain alone. Such post-digital ecotones are not limited to technological artifacts. They also encompass cultural and relational tensions, including the contradictions and innovations that arise when established professional practices are confronted with new technological possibilities. These tensions are not inherently negative; rather, they represent fertile ground for critical reflection, creativity, and learning.

In this study, the GenAI vignette operates as an ecotone, inviting students into a professional dilemma shaped by digital mediation and ethical ambiguity. To succeed in ecotone spaces, students must develop more than just technical skills. They must become deliberate professionals who reflect critically, make ethical judgements, and act responsibly in complex, uncertain environments (Trede & Jackson, 2021). The concept of agency is central to the development of such professional capacity, which Trede and Jackson (2021) describe as the ability to act intentionally, take responsibility, and make ethical and context-sensitive decisions within complex professional environments. Instead of being a fixed aspect of the person, this agency is developed through reflective engagement and social participation. Deliberate professionals are characterized by their capacity to integrate personal values with professional responsibilities: they do not merely follow procedures but engage thoughtfully with their situations (Trede & Jackson, 2021). This reflexive stance is essential for navigating the tensions and opportunities inherent in post-digital professional landscapes.

Professional Judgement Through Reflection

To understand how such reflective and professional judgement can be cultivated, this study draws on the work of Dewey and Rodgers. Dewey (2005) regarded learning and experience as inseparable and simultaneously considered reflection as a central process in transforming experiences into meaningful knowledge. According to Dewey (1933), experience is not merely a passive process but rather an active one, where the individual engages with their surroundings, encounters challenges, and processes them through reflection; at the same time, he did not equate activity with the formation of experience. Dewey (1963) also described reflection as a systematic, disciplined form of thinking that arises in response to a problematic situation. He introduced the concept of reflective thinking, which involves a conscious and analytical approach to understanding encountered experiences and deriving learning from them.

Rodgers (2002) expands on Dewey's work by identifying four core characteristics of reflection that are especially relevant in educational settings. First, reflection is a meaning-making process through which learners connect prior knowledge with new experiences and anticipate future actions. Second, it is systematic and rigorous, involving analysis, questioning, and drawing conclusions. Third, it is socially situated and shaped through dialogue and interaction with others. Fourth, it is a dispositional orientation marked by openness, curiosity, and a commitment to growth. Rodgers (2002) also outlines six dynamic phases of reflection: experiencing a situation, interpreting it instinctively, identifying the underlying problem, generating explanations, elaborating the explanations into coherent hypotheses, and testing the hypotheses through action. This model explains how students progress from surface-level reactions towards more profound, ethically grounded judgements.

These theoretical perspectives offer a complementary framework for understanding how students develop professional judgement through reflective engagement with technology. Dewey's and Rodgers' perspectives frame reflection as a systematic process of inquiry, while the concept of ecotones highlights the hybrid spaces where digital and analogue practices intersect. Trede and Jackson's notion of the deliberate professional adds a professional lens, showing how reflection supports ethical judgement and agency. In this study, the GenAI vignette serves as a reflection trigger that prompts students to examine their assumptions and decisions. We explore how such scenarios support judgement for-

mation in educational ecotones shaped by the interplay of technology, ethics, and professional practice. Building on this integrated framework, the following section outlines the case study design and methodological approach used to investigate students' reflections in practice.

Methods

Case Study Design in a Post-Digital Context

This study applies a qualitative case study approach (Yin, 2009) to explore how students from three higher education programs – Social Education (SE), Health Administration and Coordination (SAC), and Digital Concept Development (D-CON) – develop professional judgement and technological literacy through reflective engagement with a GenAI vignette. The vignette was designed to trigger reflection on ethically complex, technology-mediated scenarios relevant to each professional field. The case study approach enables a detailed examination of how students engage with professional dilemmas in specific educational and disciplinary contexts. These three programs were selected for their differing engagements with digital technologies and their contrasting perspectives on care, regulation, and innovation. This variation offers a valuable foundation for analysing how professional judgement is interpreted and developed in diverse post-digital learning environments. The three programs were purposefully selected to represent different engagements with digital technology. Within each program, all students in the relevant semester were invited, ensuring broad participation rather than selective sampling.

GenAI Vignette

A GenAI vignette was central to the empirical design of the study. This vignette was presented as a 3-minute and 25-second video portraying a fictional, ethically challenging scenario. The scenario describes an organization developing an AI app to help autistic individuals interpret emotional expressions. The vignette was intentionally designed to trigger reflection on technological and relational issues, functioning as a learning stimulus and a medium for engaging students in post-digital thinking. In this way, the vignette created a reflective ecotone that encouraged students to consider the implications of technology in their future professional practice.

Figure 1: Image of the GenAI vignette



Data Collection

Data were collected through written group reflections and focus group interviews. A total of 95 students participated. First, students participated in group-based reflection tasks using questions tailored to their professional field. These reflections were written collaboratively, and students were encouraged to interpret the vignette through their disciplinary lens. Second, one focus group interview was conducted for each of the three programs. Students worked in groups of 3–5, adjusted to class size. Focus group participants were recruited voluntarily from these classes to capture a range of perspectives. Three to five students participated in each interview, which lasted 37–50 minutes. All participants provided informed consent, and ethical approval was obtained. The data were anonymized and stored securely in accordance with GDPR guidelines. The interviewer had no prior relationship with the participants and adopted a neutral, facilitative role to promote open discussion while minimizing potential bias.

The questions used in the interviews matched those used in the reflection tasks. The interviews were facilitated by a researcher who guided the discussion neutrally and ensured balanced participation (Creswell & Creswell, 2018). An overview of the data collection is shown in Table 1.

Table 1: Overview of Data Collection

Program	Date	Focus group interview	Reflection groups	Total students	Semester
Social Education	15.11.2024	3 students, 45 minutes	6 groups (3–4 students)	23	3 rd
Digital Concept Development	16.09.2024	5 students, 50 minutes	4 groups (4 students)	21	5 th
Health Administration	01.10.2024	4 students, 37 minutes	4 groups (4 students)	20	5 th

Analytical Strategy

The analysis in this study is grounded in Dewey's reflection theory (2005). It is further operationalized through Rodgers' (2002) interpretation, which identifies the four core characteristics of reflection and the six iterative phases. This framework allows for a structured examination of how students engage reflectively with the AI-generated vignette and how their understanding of professional judgement in technology-rich environments evolves. Coding proceeded in three steps: open coding of all transcripts and reflections, alignment of codes with Rodgers' six phases, and comparison across the three programs. To ensure credibility, a second researcher independently coded a subset of the data, and discrepancies were discussed until consensus was reached.

The first analytical lens focuses on identifying evidence of meaning-making processes, where students connected prior knowledge, their own experiences, and future-oriented insights. This involved tracing how students interpreted the vignette in relation to their existing professional perspectives. It also involved tracing how new understandings emerged through group reflection and interview discussions.

The second lens focuses on the systematic and rigorous nature of reflection. We looked for moments in the data where students engaged in deliberate reasoning, raised critical questions, and evaluated assumptions. These segments were used to assess the depth and structure of their reflective thinking.

Third, we examined reflection as a social process, analysing how ideas were negotiated, challenged, or supported through peer interaction.

We paid attention to how social dynamics within group tasks and focus groups shaped the reflective dialogue.

Finally, we identified expressions of reflective dispositions or attitudes, such as curiosity, openness to learning, and a willingness to consider alternative viewpoints. These indicators helped us understand students' orientation toward reflection as a habit of mind and an ethical stance. To assess the depth of reflection, all data (written reflections and interview transcripts) were coded using Rodgers' six reflective phases (Table 2).

Table 2: Analytical Strategy with Examples

Rodgers' reflective phase	What we looked for	Illustrative example
1. Concrete experience	Initial reactions to the vignette as a professional dilemma; recognition of relevance to students' future roles	“According to the Data Protection Act, consent must be obtained every time photos are taken. One must be aware of where the photos are stored and who to contact in case of a security breach.” (SAC student)
2. Spontaneous interpretation	Emotional responses, personal attitudes towards AI, digitalization, and human interaction	“No, because I was sitting there thinking that if someone has very little facial expression, then it's also difficult to scan a picture and figure out what they're actually thinking.” (SAC student)
3. Problem identification	Statements clearly articulating ethical, legal, or relational dilemmas presented in the vignette	“I mean, does it actually benefit the patient, or are we really just making things harder – are we making it harder for them rather than better?” (SAC student)
4. Generation of explanations	Use of theory, prior knowledge, or professional experience to interpret or explain issues	“You can never be sure that the expression the app detects matches how the person really feels. Can it decode sarcasm?” (SE student)
5. Development of hypotheses	Extended reasoning, exploration of alternatives, or co-construction of reflective insights in group discussion	“...I also think it's easier physically. That is, if there is a social educator or someone to support. It's easier to adjust according to where they need help than an app that is locked.” (SE student)

Rodgers' reflective phase	What we looked for	Illustrative example
6. Testing hypotheses	Concrete suggestions or critical re-framing of technology use in future scenarios; evidence of practical application or ethical positioning	“One can easily imagine that when something like this is being implemented, it will demand a lot of their resources – that they will have to start using this technology, and you don’t really know whether they actually have the competencies to use it.” (SAC student)

To enhance analytical credibility, a second researcher independently reviewed selected transcripts, and differences in interpretation were discussed to ensure consistency in coding. This approach facilitated a systematic examination of how reflection unfolds across different student groups and disciplines. It also examined how such reflection contributed to developing professional judgement in post-digital learning contexts. While this study does not follow students longitudinally, its design captures situated and immediate reflections that are central to its focus on technology-mediated reflective triggers.

Results

Social Education

A clear pattern emerges from students' reflections in the Social Education (SE) program. Using Rodgers' (2002) phases of reflection as an analytical lens, it is evident that these students engaged deeply in the vignette. A particular example of this is the use of relational ethics and resistance to technological mediation in ways that foreground relational ethics.

In the initial phases (from concrete experience to spontaneous interpretation), students expressed strong scepticism toward the app and, more broadly, toward digital technologies in relational contexts. Their responses often reflected discomfort with what they perceived as the de-humanizing effects of digitalization on interpersonal care, a domain they viewed as central to their professional identity. For example, one student said: “I can see the idea of helping someone with autism understand others' emotions. But I think, in general, I'm against where digitalization is heading and what it means. When everything happens on a screen... face-to-face interaction is different” (SE student A). This reaction aligns

with Dewey's understanding of reflection as triggered by the disruption of familiar routine. The dilemma presented in the vignette challenged students' values in a professional context. It triggered reflection grounded in their prior experiences. Indeed, students consistently emphasized the importance of authentic human connection and strongly opposed AI replacing relational care:

Interviewer: "You don't think an AI assistant is what they need?"

Student: "No, they need real people." (SE student B)

Students described the AI narrator in the vignette as unnatural and emotionally inadequate, raising doubts about its usefulness in supporting social understanding among autistic individuals. In the phases of problem identification and explanation generation, students discussed stigma-related concerns, awkward social situations, and questions of consent. One student noted: "If you're supposed to say, 'Hey, can I take a picture of you?... that's going to be weird" (SE student A). In generating explanations, students explored the ethical implications of these situations, linking them to broader issues of human dignity, agency, and privacy. They critically examined potential violations of legal and ethical standards, such as data protection under the GDPR. This shift from instinctive reaction to structured, analytical reasoning reflects Dewey's concept of reflection as purposeful inquiry rooted in lived experience.

Several students proposed alternative uses for the app that align more closely with their professional values. For example, they suggested that the app could be a training tool in a collaborative setting where a social educator guides interpretation and reflection. This suggestion demonstrates an effort to reimagine technology to enhance, rather than replace, relational pedagogy. Their reflections continued into more complex ethical terrain, as they questioned whether an app could meaningfully interpret emotional nuance: "You can never be sure that the expression the app detects matches how the person really feels. Can it decode sarcasm?" (Reflection Group 1). These reflections unfold within an ecotone, with SE students positioning themselves as protectors of relational ethics in this space where digital tools and analogue values intersect and generate tension. They expressed concern that technological solutions might oversimplify autistic needs. Many emphasized the importance of supporting autonomy and warned against dependency on digital aids.

Across both interviews and written reflections, SE students demonstrated a reflective posture consistent with Trede and Jackson's (2021) concept of the deliberate professional. Their reflections revealed an ability to integrate ethical reasoning, professional responsibility, and personal values to form context-sensitive judgements. Rather than treating technology as a neutral tool, they critically examined its implications and placed its potential use within a broader framework of pedagogical care. The SE students thus articulated a relationally grounded, ethically conscious approach to professional judgement. Strong professional identities and commitment to human-centred practice clearly shaped their reflections, exemplifying how critical, situated technological literacy is essential for navigating post-digital professional environments.

Health Administration and Coordination

Students from the Health Administration and Coordination (SAC) program engaged with the vignette by drawing on their knowledge of organizational procedures, legal frameworks, and systems-level thinking. Their reflections demonstrate how professional judgement develops by considering ethical and administrative complexities.

In the initial phases of reflection (concrete experience and spontaneous interpretation), students focused on data protection, consent, and compliance. The fictional scenario was treated as a plausible situation, and their immediate responses centred on the legal and procedural implications of the app: "According to the Data Protection Act, consent must be obtained every time photos are taken. One must know where photos are stored and who to contact in case of a security breach" (Reflection Group 2). These reactions suggest that the vignette functioned as a realistic stimulus for engaging in regulatory knowledge. Some students also questioned the app's technical reliability and emotional detection limits. One student remarked: "If someone has minimal facial expression, it's also difficult to scan a picture and figure out what they're thinking" (Focus Group). As students moved into the next reflection phase, they identified problems more systematically. These included concerns about user experience, stigmatization, and the ethical implications of AI in sensitive care settings. Their reflections reflect what Ryberg et al. (2021) describe as ecotonal thinking, where students navigate the boundaries between digital tools and human-centred care.

In generating explanations, the students applied knowledge from their professional training to interpret and explain the challenges. They considered alternative implementations and drew on ethical frameworks to assess potential risks. In one interview, a student questioned the app's fundamental value: "Does it benefit the patient, or are we just making things harder rather than better?" (Student A, Focus Group). Although students did not explicitly formulate testable hypotheses, they proposed possible adjustments, such as obtaining consent from relatives or involving user organizations like the Autism Society. These ideas reflect preliminary hypotheses about how the app could be developed more responsibly.

Towards the end, students discussed how the app might be implemented in practice, addressing organizational change, legal compliance, and resource demands. In doing so, they moved into a phase of planning and tentative application, as seen in the following comment: "When something like this is implemented, it will demand many resources. They'll have to start using this technology, and you don't know whether they have the competencies to use it" (Student A, Focus Group). These considerations reveal a concern for feasibility and an awareness of ethical responsibilities; students reflected on how change must be managed thoughtfully to avoid unintended harm or dependency.

The SAC students thus positioned themselves as mediators between technology, legal standards, and care practices. Their reflections were grounded in regulatory and systemic logic but also showed ethical awareness and responsibility. This orientation aligns with deliberate professional practice and demonstrates how reflective practice can support informed, context-sensitive decision-making in administrative roles.

Digital Concept Development

Students from the Digital Concept Development (D-CON) program approached the vignette with a strong sense of professional identity shaped by digital design practices. Tools such as Adobe XD and Generative AI were seen as natural parts of their everyday work. Their reflections illustrated what Dewey (2005) describes as learning grounded in lived experience.

In the early phases of reflection, particularly during concrete experiences and spontaneous interpretation, students focused on usability, interaction design, and user experience. Rather than raising ethical con-

cerns, they addressed the scenario as a design challenge to be solved. One group noted the need for iterative testing and user variation: “There should be user testing and targeted group analysis. The autism spectrum is very broad, and it’s difficult to map behaviour patterns” (Reflection Group 2). As their reflection progressed to identifying problems and generating explanations, students continued to frame their thinking through functionality and optimization. The ethical considerations raised were often limited to legal aspects such as data protection under the GDPR rather than broader societal or relational concerns.

Some students expressed a more critical perspective, raising questions about professional responsibility and the boundaries of participation in ethically ambiguous projects. One student reflected: “I think I’d need to do more research before accepting a project like this, especially if it feels ethically grey. You must decide what you want to be part of and where your boundaries are” (D-CON student A, Focus Group). Such comments suggest an emerging awareness of ethical agency and reflect the beginnings of what Trede and Jackson (2021) describe as the deliberate professional. While this perspective was not dominant across the data, it indicates a potential shift from task-oriented thinking to more reflective judgement.

In several cases, students moved toward the fourth phase of Rodgers’ (2002) model by integrating professional knowledge (e.g., about data protection laws) into their reflections. For example, one student stated: “The user must have permission to take pictures of other people when they are stored in the app” (Reflection Group 1). Although few reflections evolved into fully formed hypotheses or tested ideas, some students showed signs of engaging with technology’s social and ethical dimensions. Their reflections remained largely functional, guided by the assumption that technology should be optimized rather than critically examined. However, occasional questions about user vulnerability, informed consent, and responsible design revealed the early stages of a more nuanced ethical stance.

D-CON students thus operated within the ecotone between technological fluency and professional responsibility. Their reflections were grounded in design logic and user-centred thinking, though some also explored ethical boundaries and personal values. These reflections provide a basis for developing more critical and ethically informed professional judgement in design-oriented education.

Summary

The three professional student groups positioned themselves differently within the ecotone between human-centred and technology-mediated professional domains. As illustrated in Figure 2, SE students predominantly defended the human dimension of professional practice, often expressing resistance to digital interventions in relational work. SAC students operated at the boundary, negotiating regulatory obligations with ethical considerations. In contrast, D-CON students navigated a more integrated space, where technological tools and professional creativity were seen as mutually reinforcing.

Figure 2: Redesigned illustration of ecotones, adapted from Ryberg et al. (2021). The figure is created by the authors

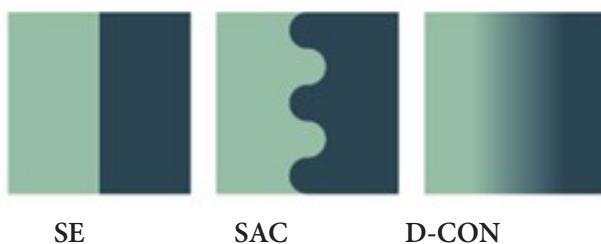


Figure 2 visualizes these dynamics by highlighting the varying degrees of tension and synthesis between analogue and digital orientations across the three groups. These positions are further summarized in Table 3, which outlines each group's conceptual role in the ecotone and the primary focus of their reflective engagement.

Table 3: Professional Roles in the Ecotone and Reflective Orientation

Group of students	Role in the ecotone	Reflective focus
Social Education students	Guardian	Relational ethics and resistance to technological mediation
Health Administration and Coordination students	Mediator	Legal frameworks, ethical regulation, and responsible implementation
Digital Concept Development students	Creator	Innovation, user experience, and functional optimization

These findings provide a basis for exploring how reflective engagement with digital technology contributes to developing professional judgement across distinct disciplinary contexts. In the following discussion, we examine the implications of these differences and consider how reflection can be more intentionally facilitated in post-digital professional education.

Concluding Discussion

This study examines how SE, SAC, and D-CON program students reflect on technology-mediated dilemmas through a GenAI vignette. The findings indicate that students' professional judgement is shaped by their disciplinary background and by the degree to which they critically reflect on technology roles in professional contexts.

In all three programs, the vignette served as a meaningful reflection trigger. The presentation of a scenario marked by ethical ambiguity and emotional complexity disrupted habitual thinking and created a space for inquiry. As theories of reflective learning emphasize, authentic reflection often emerges in response to emotionally or ethically charged situations. The findings also reinforce previous research showing that reflection does not arise automatically from structured educational tasks, even in practice-oriented programs. As Brown et al. (2013) and de la

Croix and Veen (2018) highlight, reflection may become performative unless it is grounded in personal relevance and meaningful engagement.

Students' responses varied according to their disciplinary perspectives. SE students moved through several reflection phases, focusing on relational ethics and human-centred care. SAC students approached the vignette through a procedural and regulatory lens, showing structured but formal reasoning about responsibility and implementation. D-CON students reflected mainly from a design-oriented perspective, emphasizing functionality and user experience, and they only occasionally questioned the ethical implications of technological decisions. These differences confirm that reflection is a socially and professionally situated process. Dewey's concept of reflection as contextually grounded inquiry and Trede and Jackson's (2021) notion of the deliberate professional provide practical frameworks for understanding how students combine values, judgement, and action when faced with uncertainty in professional situations.

The study also underscored the value of a supportive learning environment. The combination of the designed vignette and collaborative reflection formats, group writing, and peer dialogue created conditions that encouraged students to explore complex professional dilemmas in depth. This is consistent with the findings of Marshall et al. (2021) and Butani et al. (2017), who emphasize the importance of autonomy, interaction, and relevance in fostering reflective capacity. This study has some limitations. Its cross-sectional design captures only immediate reflections and does not show how professional judgement develops over time. The findings are based on three programs in one institutional context, which may limit generalizability to other settings. Finally, although efforts were made to minimize researcher influence, the presence of a facilitator may have shaped the reflective dialogue. Future research could address these limitations by employing longitudinal designs, larger and more diverse samples, and alternative facilitation strategies.

In conclusion, this study asked: *How is students' professional judgement influenced and shaped through reflective engagement with digital technology?* The findings show that GenAI vignettes can act as powerful reflection triggers, enabling students to critically explore professional dilemmas in ways shaped by their disciplinary orientation. Social Education students emphasized relational ethics, Health Administration students focused on regulation and implementation, and Digital Concept Development

students highlighted functionality and innovation. Together, these perspectives illustrate that professional judgement emerges not simply from exposure to practice or technology, but from structured opportunities for critical reflection in ethically complex, digitally mediated contexts.

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Disruptive Technologies and Peer-learning for Dialogue and Reflection

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Abstract

This paper presents a study of reflection in online, intercultural dialogues between teacher students from The United States of America and Denmark. The study is based on a Collaborative Online International Learning (COIL) exchange between the teacher education programs at University at Albany, SUNY, USA, and University College of Northern Denmark, Aalborg. The COIL project aimed to provide students with cross-cultural perspectives on teaching while fostering reflection about how cultural factors shape educational systems and practice. COIL allows for increased opportunity for the intercultural exchange of ideas without the difficulties of traditional physical exchange. However, it can also potentially decrease experiences of “human” interaction and reflection. Thus, this study explores how online exchange can be structured to create optimal opportunities for peer-learning and reflection. The study’s data is produced through a mixed survey, excerpts from student reflections, comments on the online platform Microsoft Teams, and student interviews. The interviews and the specific student’s reflection assignments formulate three cases that illustrate different approaches to participation in online dialogue and subsequent routes to reflection. The methods of case study and informed grounded theory investigate how the differences between asynchronous and synchronous multimodal exchange impact the students’ experiences of the selected affordances of an online platform as disruptive or non-disruptive, and how this influences their intercultural dialogue and level of reflection. The conclusions from the analysis suggest recommendations for additional scaffolding of online exchanges in future practice as well as themes for further research.

Key words

Dialogue, Reflection, Online Exchange, Intercultural Learning, Peer-learning, Affordances, Synchronous/Asynchronous, Disruptive Technologies, COIL, Intercultural Dialogue

Introduction

The context of this study was a Collaborative Online International Learning (COIL) project in which students from University at Albany, SUNY, USA, and University College of Northern Denmark (UCN), Aalborg collaborated to explore the respective educational systems and the local views of the purpose of education in the two student communities. The intention was to foster reflection in action and to catalyze and scaffold local, personal and insightful dialogues within peer-teams. The concept of COIL developed from the emergence of general online communication opportunities in learning management systems (Naicker et al., 2022), and a wide adoption of online communication in the everyday life of students. These technologies provided opportunities to bridge physical distances by connecting multimodally across geographical boundaries. These technologies have been utilized in distance and e-learning for more than two decades (Lee & McLoughlin, 2007) and the pedagogies for teaching through online platforms have been developed to include dialogic and reflective practices (Kjærgaard & Wahl, 2015; Sorensen & Kjærgaard, 2016; Zakaria et al., 2023). This COIL project utilized the past decades' refinement of distance and e-learning, which provided a well-known set of affordances for communicating that were already nested in the learning platforms. However, this particular way of engaging in educational dialogue to foster reflection was new to the majority of the participants. Investigating this disruption to the default approach to educational dialogue was therefore deemed relevant and necessary to determine how such an approach can influence learning. Thus, this study investigated the extent to which the interposition of TEAMS as a framing, delineating and limiting technology influenced opportunities for intercultural dialogue and reflection through the following research question:

How do the affordances of disruptive technologies influence reflection and intercultural dialogue in peer-learning-groups in an online intercultural exchange?

Context

The theme of the COIL project was 'Dialogues in Education'. The students were organized into 17 peer-teams (one group of SUNY students and one group of UCN students in each peer-team) that collaborated through their assigned channel in Microsoft Teams (TEAMS). The channels were open to all participants (students and lecturers).

The students completed various tasks throughout 4 stages of the project over a period of 6 weeks. For the first stage, students produced a short introductory video which provided background on their educational context. The videos were shared and viewed in the peer-team channel. In stage two, the students engaged in dialogue regarding the similarities and differences and underlying values of their respective educational systems. This dialogue took place through an asynchronous exchange via the TEAMS discussion board or a synchronous videoconference on TEAMS. The peer-team then wrote a brief collaborative summary of their findings. Finally, in stage four, the students individually reflected on their experience and learning through a written or video reflection. Throughout the project, the students also reflected on the process with their "home" classes and lecturers.

Theory and Definitions

This section introduces and defines the central terms and concepts used in the analyses.

Affordance

The notion of affordance describes both the objective potential of a technology (specifications and features) (Gibson, 1977) and the subjective potential of a user's exploitation of the technology (Gaver, 1991). It raises questions regarding what functionality the technology offers, which functions can actually be used in a specific context, and who or what can scaffold the user's benefit from using the technology in a specific context (Conole & Dyke, 2004; Evans et al., 2017).

Technology and Disruption

In this study, technology is understood as “the application of conceptual knowledge to achieve practical goals, especially in a reproducible way” (Skolnikoff, 1994) Additionally, languages are recognized as partially natural and partially technological, whereby dialogical and reflective skills can be developed and improved through focused techniques. Thus, the COIL project may have disrupted the general understanding of language in a monocultural context through utilizing technology to develop methods of communication across languages and cultural contexts.

“Disruptive technology” is a business term used to describe a set of circumstances, “where technologies improve a product or service in ways that the market does not expect” (Christensen et al., 2015). The technological affordances of COIL disrupt the concepts of “international exchange” in an educational setting by improving the possibilities for virtual, rather than physical, exchange.

Dialogue

Dialogue is understood as “thinking together through language” (Kjærgaard & Georgsen, 2021; Mercer et al., 2019). It is a refined type of purposeful conversation in which learning, respect and understanding are key, and is therefore categorized as educational dialogue (Tartas, V., Bau-cal, A., & Anne-Nelly, P. (2010) Studies of educational dialogues (Kjærgaard, 2016; Kjærgaard & Georgsen, 2021; Kjærgaard & Andersen, 2023; Sorensen & Kjærgaard, 2016), show that this type of dialogue spirals upwards toward deliberation through a state of flow that entails less focus on turn-taking protocol and more focus on learning.

Intercultural Dialogue

Intercultural dialogue is understood as a transformative form of communication in which the participants engage in dialogue in order to learn and share perspectives, wherein the term intercultural refers to two or more peoples, nationalities, age groups, sub-cultures, ethnicities etc. who meet in an activity of shared interest (Elias & Mansouri, 2020). The perspective awareness developed through this type of intercultural dialogue leads to the development of multiperspectivity: a state in which individuals are able to decenter, see viewpoints, context, and situations from different angles, and thereby increase cultural learning. (Huber, 2012, chap. 1)

Reflection

Reflection is understood as analytical and critical thinking: “the process of critically assessing the content, process, or premise(s) of our efforts to interpret and give meaning to an experience” (Mezirow, 1991 p. 104). Additionally, reflection is viewed as the ordering of thinking in a consecutive sequence that forms a chain, wherein each thought builds upon previous thoughts in order to develop the following thought (Dewey, 1933, p. 3). The COIL project was designed to foster this type of critical reflection: thinking that required participants to listen and analyze utterances from others, critically assess the content of the utterance in relation to the learning gained from the dialogue, and to use that assessment to give rise to new and/or deeper questions (Dewey, 1933).

Data and Method

This study investigated the outcome of the COIL project through the description of three cases that emerged from the data, followed by an analysis of the cases and other data sources in relation to the research question using an informed grounded theory approach. The data supporting this study can be accounted for as follows:

Table 1: Overview of the primary data of the study

	Data type	Population	Institution
Quantitative	Observation: dialogues/videos in TEAMS	N=17	Peer-teams
	Reflection papers/videos	N=61	UCN: N=27 SUNY: N=34
	Interviews with students	N=6	UCN: N=4 SUNY: N=2
	Open-ended answers in the survey	N=61	UCN: N=27 SUNY: N=34
Qualitative	Close-ended answers in the survey	N=61	UCN: N=27 SUNY: N=34

The initial data source was the observations of the peer-team channels and the student reflection papers, which provided insight into all the stu-

students' experiences in real-time, while also identifying levels of student engagement with the online technologies, participation in intercultural dialogue, and evidence of their level of reflection based on their questions and comments.

Six student interviews were conducted on a voluntary basis and selected using intentional sampling based on the existing data to create a representative sample of the different levels of engagement with the themes of the research question. Three interviews were subsequently selected to provide the basis for the three case studies. The interview data for each case was supplemented by the respective student's contributions in TEAMS as well as the final reflection paper/video. The case descriptions were formulated to express a particular experience with the COIL dependent on whether the case was exemplary or extreme (Flyvbjerg, 2006; Yazan, 2015; Yin, 2018; Zakaria et al., 2023). One of the cases was an extreme case because the student had read and watched all videos, posts, and comments in all 17 peer-team channels. The other two cases were exemplary cases since they exemplified two different experiences with the COIL based on whether the peer-team communicated asynchronously or synchronously. Hence, the cases were formulated with the research question in mind and aimed to present a selection of students' in-depth experience with the COIL, with focus on the themes of disruptive technologies, reflection, and intercultural dialogue.

The survey provided insight into the demographics of the population, which consisted of mainly 20–24-year-olds (66%), with a slightly higher representation of female students (56%). However, the survey's main contribution was to provide background for answering the research question and to supplement the observations, interviews and other data with a wider insight into the participants' experience with the COIL project.

The data from the cases was synthesized with the outstanding data from the survey and other interviews, as well as the remaining students' reflection papers/videos and contributions in TEAMS to provide a wider representation of the extended student population's experiences with the COIL. This synthesis used an informed grounded theory approach to continually integrate each new data set with the existing data, theoretical stances and emerging analytical viewpoints to allow for the emergence of an answer to the research question (Thornberg, 2012). The analysis reflected the three different levels of engagement that had been found through the intentional sampling process for the interviews and provid-

ed an opportunity to combine the qualitative and quantitative data to answer the research question and present topics for further research.

Case-studies

Case Description 1: Sofie's Asynchronous Exchange

Sofie is a 21-year-old student enrolled in the Teacher Education bachelor program at UCN. She is in her 3rd year of a 4-year program and is specializing in math, English, and home economics. Sofie described her overall experience with the COIL as positive but felt that the asynchronous format of the exchange resulted in the dialogue being somewhat broad and superficial. She characterized the asynchronous discussion boards as being less of a group dialogue between all members, and more of a “question and answer” structure, wherein one member would post a question, one or two others would answer, and then they would move on to a new question and repeat the process. Sofie felt that this format led to a wide discussion of many topics, but on a superficial level rather than delving into all potential aspects of each topic.

Sofie hypothesized that a synchronous video call may have allowed for more in-depth conversation on fewer topics, wherein all team members could have shared their perspectives and asked follow-up questions. She states, “I think then [...] everybody would say *their* perspective on the topic, instead of two people talking and then another one making a thread and posting. And if we’re all talking, we wouldn’t just change the subject because that would be rude.”

Since her peer-team was unable to participate in a video call, Sofie credited the introductory videos as essential in “humanizing” the COIL exchange. She stated, “we [were] just looking forward to see each other, so I think that it was great also that we got to see each other and who we are and like get a closer relation in some way by seeing each other’s face.” The weight that Sofie placed on the introductory videos was due to the importance of being able to read body language and have a “face to face” interaction through visual media, which facilitated a connection that could not be created through written text alone.

Overall, Sofie found that even the “superficial” interactions in TEAMs ultimately provided a foundation for deeper reflection when sharing the experience with her Danish peers post-COIL. She stated, “It was also nice that we had some activities after the COIL project about what we

have talked about and experienced, because [...] it was also really interesting to hear about what was the most important thing that somebody else explored. [...] And a lot of us had this deeper reflection afterwards, I think." For Sofie, more structured face-to-face dialogue provided the space and time for deeper reflection.

One of Sofie's most impactful realizations was an understanding of the need to move beyond an initial thought of "that's weird," and understand the cultural and systematic elements that underpin an observation. Sofie hypothesized that the reason for these deeper reflections was that engaging in dialogue with other members of her class at UCN meant that "I would get to think more about it because I would have to explain it to somebody else," as well as adding additional input and different perspectives that she may not have considered had her "normal" thought patterns not been disrupted by participation in the COIL.

Case Description 2: Paige's Synchronous Exchange

Paige is a 24-year-old student enrolled in a SUNY graduate teacher education program. She holds an undergraduate degree in political science and is studying to be a secondary school social studies teacher.

She characterized her COIL experience as "eye-opening," emphasizing that it prompted her to rethink her understanding of American education policy and to question some aspects of that system, which she described as "competitive" and a reflection of Capitalism. Through this project, she felt connected to her Danish peers, who shared her passionate commitment to education and who helped her see her own education system with "fresh" eyes. She gained new insights into what she describes as the "regionality" of American schools in contrast to the "uniformality" of Danish schools, and she reconsidered the curriculum in American schools, which she now believes is disconnected from the concerns of parents, in contrast to the more significant role of parents in Danish schools. Ultimately, she said, "I was fascinated, in a bad way, by how much I learned about the American system—to feel how segregated our system is, by both race and also socio-economic status." But the project also reinforced her belief in teaching. She learned, she said, that "all teachers, really, have very similar goals, . . . and that's something special."

For Paige, the impact of this experience arose from the use of video technologies, including the introductory videos and the video conferencing software that her peer-team used for a two-hour synchronous

meeting. Although the introductory videos were asynchronous, they lent an intimacy to the interactions that was reinforced by the synchronous video conferencing: “We were all in each other’s living rooms, [...] and that was really special.” The video meeting with her Danish peers “made me feel like I knew them personally” in a way that the asynchronous discussion board did not. Interestingly, for her required reflective essay, Paige chose to submit a video rather than a written text, which perhaps indicated that she had embraced the affordances of video technology.

The key to the reflection and rethinking that Paige demonstrated seems to be the opportunity to work closely with pre-professional peers from a different national context who shared a fundamental belief in education as a public good. The basic structure of the COIL prompted students from both countries to learn about key aspects of their own education system in comparison with the other system. The intimacy and immediacy of the video technologies enabled the students to engage in in-depth shared inquiry to explore differences in the Danish and American education systems and illuminated the similarities in the sense of purpose that these teachers-in-training embraced. The technologies were disruptive in a way that provoked reflection, but at the same time they allowed for a reassuring familiarity among the students.

Case Description 3: Eric the Extremist’s Open-access Exchange

Eric is a 21-year-old student enrolled in the Teacher Education bachelor program at UCN. He is in his 4th semester and studying the subjects English, STEM and PE. He was generally positive towards doing international collaborations such as COIL-projects, and he stated that he has learned a lot from taking part in COIL-projects. This was his third international collaboration at UCN, and he said it was by far the most constructive COIL he has experienced.

He is defined as an ‘extreme case’ (Flyvbjerg, 2006; Yin, 2018) in the empirical data since he had watched and read most, if not all, comments and videos in the various TEAMS channels. He explained that discussion boards and threaded communication in general were very familiar to him and that he participated in other fora online in relation to his interests. He particularly appreciated the combination of introductory videos and accompanying written discussion in the COIL design. As he explained, the multimodality of the communication in his own peer-group channel gave him a more ‘full’ understanding of the person “at the

other end.” Furthermore, this motivated him to search for other interesting conversations in the other channels. He said that he didn’t anticipate specific input or points of view, rather, he let serendipity guide the way. This opened a “networked understanding” of the whole COIL project (Dohn; Kjærgaard, Rasmussen, & Hachmann, 2022). Instead of just focusing on completing the tasks in his own peer-group, he formed an understanding of relations and exchanges in the entire population of the project, which gave him a more detailed view on the cultural differences among the participants. While reading laterally across the channels, he narrowed down his reading strategy from open and serendipitous, to focusing on specific people, and finally into more detailed dialogues. He started searching for the theme of “the purpose of education” as it emerged in the discussions and found 4–5 students in the other channels, who he started following. He deemed these 4–5 key participants interesting because they shared deeper thoughts and raised more precise question than the generic “what is it like to attend university in the US, I bet it is expensive?” In addition to reading their conversations, he also looked them up on social media in order to gain a more in-depth understanding of them as people – not just students.

He utilized his extensive, prior experiences with online communication (gaming etc.) to exploit the possibilities for learning and engaging in a new network. The open learning approach led him to think of the COIL project as a community and not just as a “school assignment.” He represented an extreme case of the objective affordance of the COIL (Gibson, 1977), which exemplified what the technology and the techniques utilized may facilitate when exploited to their full extent.

He was very active in his own peer-team, producing videos and opening posts and commenting on other students’ posts. However, in the other channels he just ‘lurked’. He said that the possibility of lurking in the other channels scaffolded his participation and further motivated him to participate in his own peer-team. To him, the open structure of the platform that allowed every student to read, post and comment in all peer-team channels was a key affordance of the technology. However, this was dependent on the active participation of the people in these channels.

Throughout this process of open learning, Eric gained insights into very different approaches to education. He encountered his own preconceived, covert and tacit belief that the purpose of education is to educate the individual for the general good of the community and to foster de-

mocracy and relevant competencies to create democratic, knowledgeable citizens. This belief was arguably very Scandinavian. However, it was countered by the US students' view that education should foster an independent and competitive individual and, furthermore, that a competitive, individualized system motivates and inspires citizens. This insight led him to reflect on preconceptions about education and the socialist/liberalist dichotomy.

Eric's case illustrated the transformative potential of online interactions in educational contexts. His engagement with multimodal communication and networked understanding, coupled with reflection on educational beliefs and active participation, showcased how technology can enhance learning experiences. By leveraging his prior experience and viewing the COIL project as a community, Eric maximized the affordances of the platform, providing valuable insights into effective online learning strategies.

Analysis of Case Studies and Additional Data

The analysis was conducted using an informed grounded theory approach (Thornberg, 2012), whereby the initial observation of student participation in the TEAMS channels led to intentionally sampled interviews and the construction of three cases. The construction of the three cases was based on the themes of the research question and therefore focused on how each student experienced the disruptive technologies, reflection, and intercultural dialogue. Three different, yet exemplary experiences emerged in the construction of the cases, and a subsequent synthesis of the outstanding data reinforced these observations.

Analysis of Disruptive Technologies

Three themes related to disruptive technologies emerged from the data and revealed differing experiences regarding how the students perceived the affordances of the technologies as disruptive in relation to language, the communicative situation, and asynchronous/synchronous communication.

The data indicated that the students generally did not regard the technologies utilized in this COIL as 'disruptive' in regard to language and literacy. They were familiar with the affordances of TEAMS and many of them expressed that they were used to even more advanced affordances

in other technologies. In Eric's case, he talked about how students use Snap-maps, which show his networks' immediate position in the world, and he explained how Reddit's upvote/downvote function and TL;DR acronyms affect the reading and writing processes online. Since these simple functions of Reddit are more disruptive to well-known literacies than those found in TEAMS, it follows that the students didn't regard the technologies used in the COIL as disruptive to their understanding of literacy and language.

However, the students did report experiencing a disruption related to the communicative situation. The students reacted negatively to the displacement in time between posting a comment and receiving a response in TEAMS. They were used to immediate and multimodal responses when they normally communicate, but they seemed to lack this quick relay between post/response in the COIL's discussion boards. The data shows that when communicating online in their private lives, the students generally regarded a delayed response as a sign of disregard or even unfriendliness. This was also reflected in Sofie's interpretation of the "rudeness" of continuing to ask questions on a discussion post when the group had moved on. However, even though the students were aware of the educational nature of the communication and the 6-hour time zone difference, they still seemed to attempt to replicate the immediacy of the communication that they normally engage in with peers. In the survey, one student stated, "We used a video call on TEAMS. This allowed us to ask any questions we wanted without waiting hours for a response because of time differences." This was contrasted by another student's response that "We really only used text, but I wished we had gotten to do a synchronous video call. I think that would have given us much more to discuss than the very infrequent responses over text."

As seen in Sofie's case, what really created a disruption for the students was that the asynchronous posts in the peer-team channels often hindered a sense of dialogue. As previously stated, dialogue is regarded as 'thinking together through language' (Kjærgaard & Georgsen, 2021; Mercer et al., 2019). An advanced level of dialogue was necessary for deliberating on a shared level of intercultural awareness in the COIL project. In prior studies of educational dialogues (Kjærgaard, 2016; Kjærgaard & Georgsen, 2021; Kjærgaard & Andersen, 2023; Sorensen & Kjærgaard, 2016), it is shown that this type of dialogue requires a reflex, relay immediacy in the responses. In the data, the students express

that they experienced a flow (Kjærgaard & Andersen, 2023) when they were able to build on each other's utterances in real time. That sense of flow was lost when the communication relied on time-shifted written responses posted at an unknown time in the future and resulted in, what Sofie referred to as, "rapid-fire" superficial questions. As one American student stated,

"while the project was beneficial, the format of it was hard and I didn't love the video and message-sending activities. No one seemed super inspired to be asynchronously sending out messages and then responding to each other later because that just created a situation like when you get lots of emails and drown in having to respond to them all. [...] Making videos and sending messages out overwhelmed me and took a lot of the fun out of learning. I would have much preferred a real small group discussion, which I think could have both taught me a lot more and made the learning more fun and memorable."

The solution suggested by this student did indeed make a difference in Paige's case. Her team solved the time-shift issue by arranging synchronous videoconferences, which lead to an in-depth, flow dialogue. Here, the technology was not disruptive, but an essential facilitator of the dialogue. Similarly, in Eric's case, the technology was also non-disruptive because it allowed him to utilize the open-access nature of the TEAMS set-up for the COIL to absorb all the utterances that he found interesting. While in Sophie's case the technology of the asynchronous discussion forum was generally regarded as disruptive, she found great potential in the asynchronous introductory videos, where much of her actual learning outcome seemed to originate. In her case, the non-disruptive affordance of the technology was to facilitate the easy sharing of high-res videos with good audio.

In order for the technologies used in an international exchange to be experienced as non-disruptive, the lecturers' knowledge of the affordances provided by the selected technologies and the students' literacies to engage with those technologies must align. The success of the exchanges and the learning outcome in the COIL seemed to be nested in meeting the students' needs and expectations while also accommodating the practicalities of communicating in ways that made them feel

proficient and empowered to communicate across borders and cultures, which in turn led to deeper reflection.

Analysis of Reflection

Analysis of the data sets yielded clear evidence that the COIL project fostered genuine reflection among the participants. For example, nearly all students reported that the project resulted in new learning about educational issues and, in some cases, prompted serious rethinking of previously held views or beliefs about education. Even the few students who did not report significant change in their views about education indicated that their interactions with peers as part of the project exposed them to new ways of thinking and raised useful questions about important educational issues. Three main factors emerged from this analysis as significant in fostering and influencing reflection on the part of the participating students: time, dialogue, and multiple modes of interaction.

Students reported the need for sufficient time to engage in dialogue with one another, to make sense of their interactions, and to address the questions raised by those interactions. In the survey, several students noted that the short time frame for the project did not necessarily provide sufficient time for conversations with their peers. Although this concern was broadly reported among the participants, students who were able to participate in a synchronous videoconference reported the most significant impact on their thinking about education. For example, although Paige expressed concern about the lack of time to engage in this project fully, given the students' busy schedules and obligations, she also emphasized that the video call enabled her to get to know her Danish peers, and that familiarity opened up opportunities for deeper exchanges. She described the experience as "holistic" as compared to an exclusively asynchronous text-based interaction. In addition, although the students reported a wish for more time, several students noted the value of simply having time allotted to engage in reflection. As one student noted in a survey response: "I think it is good to get a space where one is able to do [reflection]. Because you so rarely get to do it, even though you know it is good for you." Therefore, although the COIL project did promote reflection, that reflection could have been deepened with a longer time frame and more synchronous interactions.

A second main factor to fostering reflection was dialogue with peers who shared similar professional goals (to become educators) and a com-

mitment to education. Paige experienced this when she learned that despite their different contexts, “all teachers, really, have very similar goals, ... and that’s something special.” The value of communicating with peers can also be seen in the survey results, where 81% of students agreed that the questions raised by their peers made them curious. This curiosity led the students to engage in a spiraling dialogue (Kjærgaard & Andersen, 2023), which led to increased reflection. Sofie, for example, reported that she reflected more deeply about her experience once she had time to discuss the project with her Danish peers “and a lot of us had this deeper reflection *afterwards, I think.*”

The third factor affecting reflection was the combination of multiple modes of interaction, which included both synchronous and asynchronous online technologies, text-based and video modes, and traditional academic writing, all of which worked synergistically to foster reflection among the participating students. Each mode of communication contributed in specific ways to create a rich opportunity for reflection. Many of the students in the survey reported that the introduction videos were essential in providing a “human” connection that established a good foundation for the rest of the project. One student commented in the survey that the introductory videos included descriptions of things like hobbies that “might seem trivial on a surface level, but I appreciated them because I feel that speaking to those objects, people, and places we choose indicates to us so much about purpose [of education].” Eric maximized the navigation of the multimodal communication tools provided by TEAMS, which resulted in an enriched educational experience for him. For Sofie, the videos, combined with the asynchronous discussion boards, provided disruption to “normal” thought patterns and encouraged her to seek deeper reflection. Paige underscored the importance of the lengthy discussion with her Danish peers during her team’s synchronous videoconference, which allowed for in-depth conversation about key educational issues. And although she felt the asynchronous communication was superficial, Sofie nonetheless emphasized the need for the more focused and deliberate kind of thinking that traditional writing can prompt, such as in the written summary statements that students were required to complete in stage 2: “Our [online] discussions were quite superficial, [...] But after [...] I was reading our statement again, I was thinking more deeply about what we talked about.”

What seems significant among all of the respondents is that dialogue and various modes of interaction functioned in combination to foster reflection; no one mode was sufficient on its own to prompt the disruptive thinking and in-depth reflection that students described. This was reflected in the survey, where one student succinctly reported, “Videos are great for introductions. Text great for focused academic interaction.”

This study showed that intercultural exchange does foster reflection, but elements of time, dialogue, and multimodality influence the *level* of that reflection. All of these elements must be scaffolded properly to provide the optimum opportunity for genuine, deep reflection.

Analysis of Intercultural Dialogue

Analysis of the data demonstrated that the intercultural nature of the COIL project was essential to creating opportunity for reflection. Intercultural dialogue allowed the students to gain new cultural knowledge, reflect on their new perspectives, and thereby ultimately achieve deeper reflection.

While Sofie, Page, and Eric took different paths to reflection, they all reported gaining new insights regarding American and Danish cultural and educational contexts. They all expressed an aspect of initial “surprise” when engaging in the opening dialogue with students from the other context, which then led to reflection and deeper insight about underlying values in their own context.

These moments of increased intercultural knowledge were made possible by the opportunity to engage in dialogue with students from a different cultural context. This can be seen in the survey results, where 71% of respondents agreed that *the questions raised by my peers were different from the questions that are normally discussed in class*. In addition, 92% of respondents indicated that they had learned something that they otherwise wouldn’t have learned. A Danish student noted, “I learned a ton about the American school system – It was a big eye-opening experience. My knowledge of the American school system was very naively rooted in pop culture, and what you see on American shows or movies. Crazy how big the difference is between the two [sources of knowledge].” Here the student highlighted the importance of intercultural dialogue as an essential way to break down stereotypes and gather more information than would not have been possible without dialogue and interaction. In these conversations the students were truly “thinking together.”

Participation in intercultural dialogue also led to increased reflection and new perspectives. 69% of respondents agreed that the COIL project had changed the way they think about education, while 79% agreed that they had learned as much about their own educational system as the other system. While some of this learning was new knowledge, much of the gain from the project was the disruption of previously held views or beliefs. Paige, Sofie, and Eric all reported how exchanges with peers from a different cultural background disrupted their prior thinking about the purposes of education and about specific aspects of educational systems. This disruption allowed them to reconsider the underlying values of their societies and practice perspective awareness. These findings were echoed in the survey where an American student noted, “I more so gained new perspective rather than new information in regard to the American education system.” New knowledge was less important than the ability to question and change one’s perspective based on intercultural dialogue. Several students appeared to be developing multiperspectivity, whereby they were able to decenter their experiences of what is “normal” and “right.”(Huber, 2012). An American student noted, “What seems ‘normal’ to me in the United States may not be ‘normal’ in Denmark, and this project has allowed me to reflect on that.” Another states, “This project has influenced how I understand reflection in education because it has made me think of things that I always just believed were the only truth and “normal”, but now I have seen different perspectives which has been a great experience.”

Ultimately, the students placed value on the intercultural learning gained through the COIL project. This was seen across the data sources throughout this analysis, but also directly in the survey where 74% of the respondents indicated that their participation in the COIL project inspired them to do intercultural exchanges when they become a teacher.

Conclusion and Suggestions for Further Research

This study intended to explore how the affordances of disruptive technology influence reflection and dialogue in peer-learning-teams in an online intercultural exchange. Through analysis of the case studies and data, it became apparent that the affordances of the technology itself in the COIL were not disruptive, but rather that the disruption lay in how those affordances were structured and scaffolded. The synergy of

multiple modalities led to the best outcome, as seen in Paige and Eric's cases, since all the affordances of the technology supplemented each other and provided rich environments for dialogue and subsequent reflection. However, it is notable that even when the students experienced disruption, the majority felt that the COIL project provided opportunities for dialogue, intercultural learning, and reflection. 98% of the students reported that the general experience of taking part in the COIL was positive. Since the COIL exchange would not have been possible without the affordances of TEAMS, it was clear that the technology was essential in creating opportunities for dialogue and reflection. However, the technology cannot stand alone, but must be well-structured by the lecturers, and must encourage active participation for the students. This study has highlighted the profound impact that well-structured online collaborative environments can have on student learning and engagement, if scaffolded appropriately. In future projects, if students' ability to navigate and utilize the multimodal communication tools provided by the technology were optimized, it could not only enrich the educational experience for the students, but also demonstrate the potential for fostering deeper, more meaningful connections and understandings.

In conclusion, this study demonstrated how COIL projects can serve as a testament to the power of technology in breaking down traditional educational boundaries and creating a more interconnected and reflective learning community. In addition, it has underscored the importance of designing online learning environments that encourage both active participation and the freedom to explore, which ultimately lead to a more holistic and transformative educational experience.

Further research could determine the optimal exploitation of the various modalities of the technology to create a COIL that promotes the best possible opportunities for dialogue and reflection. Notably, there seems to be a discrepancy between how students use technology in the academic arena versus how they use technology in their personal lives. The affordances of TEAMS bridged both arenas and perhaps resulted in confusion for the students about how to respond to delay in responses on the asynchronous message boards, as well as how to navigate the unspoken rules regulating turn-taking and flow in the dialogue. While one solution is simply to exclusively engage in synchronous communication, there are perhaps unexplored values related to asynchronous communication or multimodality that could be investigated.

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Integrating Virtual Reality in Occupational Therapy Education

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Abstract

In the early semesters of the occupational therapy education, students often struggle to develop a deeper understanding of clinical practice, their professional responsibilities, and the challenges faced by future clients. Virtual reality (VR) offers the potential to immerse students in specific situations, such as everyday life scenarios or health-related experiences, thereby enhancing their understanding. This study builds on the theoretical foundation that VR can support reflection and subsequent action, contributing to practice-based learning. The teaching was guided by the Reflective Practice-Based Learning (RPL) principle 4: 'The Good Example', in which students share a common experience that serves as a basis for collective reflection. The study aimed to explore the experiences of both students and educators when integrating VR into occupational therapy education. Two types of data were collected: 1) Evaluation data – four VR sessions were conducted during relevant teaching activities, followed by short questionnaires addressing the experiences of both students and educators; 2) Workshop data – students tested VR and brainstormed possible applications in education. The TPACK model, along with the analytic elements from RPL Experience, Thinking, and Action, was used to support the analysis. Findings indicate that VR provides a safe and realistic environment in which students can observe and experience clinically relevant scenarios. It enhances empathy, deepens understanding of client challenges, and helps bridge the gap between theory and practice. Overall, based on the students' expressed interests and suggestions, there is clear potential for further development and exploration of VR in occupational therapy education.

Keywords

Virtual Reality, Reflection, Learning, Occupational Therapy program

Background and Problem Statement

Educators have observed that occupational therapy students in the early semesters of their program struggle to develop a deeper understanding of the clinical practice they will engage in during their upcoming clinical practice. They also face challenges in comprehending the professional tasks that occupational therapists typically perform, as well as the diverse patient groups they will encounter. Furthermore, prospective employers expect occupational therapy students to have experience with various types of technology and to have acquired specific technological competencies. Similarly, students express in semester evaluations during the initial semesters that they only gain an understanding of what occupational therapy entails and how it differs from other health professions relatively late in their studies.

Virtual reality (VR) technology has garnered attention in educational research for its potential to enhance learning experiences across various disciplines. Studies indicate that VR can improve student engagement, knowledge retention, and skill acquisition by providing immersive and interactive environments. A systematic review found that VR enables nursing students to actively participate in realistic scenarios, thereby enhancing their understanding of theoretical concepts and offering hands-on training in a safe setting (Liu et al., 2023). A Norwegian study (Høye & Severinsen, 2024) shows that students in health and social care education perceive VR simulation as a useful tool for preparing for professional practice. VR simulation is considered particularly valuable for developing professional skills, especially for students who require more time and experience to build confidence in their future roles. By integrating relevant elements from the work environment and enabling repeated practice, VR can contribute to more thorough preparation for the demands and situations students may encounter in clinical practice. A Canadian study supports this perspective by examining occupational therapy students' perceptions of VR as a pedagogical tool in their education (Erler et al., 2023). In the study, students were introduced to VR modules simulating realistic clinical scenarios. Through surveys and interviews, students expressed that VR was both engaging and conducive

to learning, particularly as a supplement to traditional teaching. They highlighted VR's ability to provide a safe and controlled environment for practicing clinical skills, which contributed to increased confidence and readiness to handle similar situations in real-life settings. Together, these studies indicate that VR holds potential as a valuable pedagogical resource in educational programmes. VR supports both the development and refinement of professional competencies in a virtual yet practice-oriented context.

For these reasons, the occupational therapy education at UCN has chosen to test and evaluate VR in selected teaching modules during the 2nd, 3rd, and 4th semesters. The expectation is that integrating VR into the curriculum enables students to experience specific situations, such as everyday life scenarios or insights into clients' diverse health conditions. This approach may help students gain practical experiences and insights, which they can integrate into their learning process. Additionally, VR can provide concrete examples of occupational therapy practice areas and patient groups, allowing students to relate this knowledge to their coursework, particularly when studying pathology and engaging with occupational therapy theories.

The rationale for integrating VR into the teaching is therefore to investigate whether it can provide students with vivid and practice-oriented examples of occupational therapy in action, including professional routines, tasks, and patient situations. As many students enter the programme without well-developed mental images of professional practice, it can be challenging for them to connect theoretical content with real-world contexts. Offering immersive experiences through VR aligns with the core principle of providing 'good examples' as described in Reflective Practice-Based Learning (Horn et al, 2020), which is applied in the occupational therapy curriculum. Specifically, the study aims to identify potential indicators that such experiences may help new students develop a more immediate and coherent understanding of occupational therapy practice in the early stages of their education, indicators that could be examined further in a subsequent, larger-scale study.

This article provides new, empirically grounded insights into how students experience VR as a means of engaging with vivid, practice-oriented examples that are directly connected to the instructional content and can enhance theoretical learning. It analyses students' assessments of VR to conventional approaches they have previously encountered for

acquiring practical knowledge and identifies the novel application areas for VR that they perceive as promising. Furthermore, the article examines educators' perspectives on VR technology, addressing both the practical challenges of implementing it in teaching and its potential to enrich students' learning experiences.

Scientific Relevance

The integration of VR into occupational therapy education is grounded in the pedagogical framework of Reflective Practice-Based Learning (RPL), which emphasises the use of 'good examples' to strengthen students' ability to connect theory with practice. To understand the pedagogical potential of VR within this framework, it is essential to explore the perspectives of both educators and students. The educator perspective is examined systematically through the lens of the Technological Pedagogical Content Knowledge (TPACK) model, which captures the interplay between technological, pedagogical, and professional knowledge required for meaningful integration of digital tools in teaching. By combining the TPACK framework with RPL principles, the study aims to generate insights into how VR can be integrated in ways that enhance both learning processes and professional understanding. The overarching research question guiding the study is:

How can Virtual Reality be meaningfully integrated into occupational therapy education to support learning in line with the principles of Reflective Practice-Based Learning?

And to address this, three research questions have been formulated.

Question 1: How do educators experience the interplay between technological, pedagogical, and professional knowledge (TPACK) concerning integration of VR into occupational therapy education?

Question 2: How do occupational therapy students experience the integration of VR in their education?

Question 3: What new applications for VR in teaching do occupational therapy students perceive after testing VR?

In this study, VR technology refers to VR headsets accompanied by a film database that enables the viewing of 360-degree videos. The database is managed by the educator via a tablet, allowing all students wearing the VR headsets to watch the same video simultaneously. Interaction with the videos is not possible. The technology used is a specific Danish-developed product called Take a Walk (TakeaWalk, 2025).

Theoretical Perspectives and Methodology

Experience, Thinking, and Action as the Basis for Learning

This project is grounded in a reflective practice learning approach, as outlined in the White Paper on Reflective Practice-based Learning (RPL) (Horn et al, 2020), which conceptualizes learning as a dynamic process involving experience, thinking, and action. Central to this understanding is the idea that learning, whether it occurs individually or in collaboration with others, emerges through reciprocal encounters between concrete practical experiences and abstract principles, concepts, or theoretical frameworks. Within this perspective, the relationship between theory and practice is understood as dialectical: action and reflection, theory and practice, and the individual and their environment are seen as interdependent and inseparable. Learning is thus viewed not as a linear transmission of knowledge but as a continuous, situated process in which meaning is created through the interplay between doing and thinking. Building on this pedagogical foundation, the project explores the potential of VR films to support students' professional development in occupational therapy education. Specifically, it investigates whether VR technology can provide immersive experiences of clinical practice, particularly in situations students have not yet encountered due to limited or no placement experience. Through exposure to realistic VR-based scenarios, students are offered opportunities to engage with professional phenomena, develop early impressions, reflect on complex interactions, and prepare for future actions in clinical practice (Horn et al, 2020).

TPACK model as a framework

The Technological Pedagogical and Content Knowledge (TPACK) framework builds on Shulman's (1986) concept of Pedagogical Content Knowledge (PCK), which highlights the importance of integrating subject knowledge with pedagogical strategies to support effective teaching. Mishra and Koehler (2006) extended this model by incorporating technological knowledge, arguing that meaningful technology integration requires an understanding of how technology, pedagogy, and content interact in specific teaching contexts. TPACK is grounded in constructivist learning theory, which views learning as an active, contextual, and reflective process. The model also reflects a dialectical understanding of teaching, where theory and practice, action and reflection, and individual and environment are seen as interrelated and mutually shaping

(Koehler & Mishra, 2009). As such, TPACK offers a dynamic perspective on professional knowledge in teaching, particularly relevant in digital and practice-oriented education. To understand how educators perceive the integration of VR technology into teaching, this study draws on the TPACK framework (Technological, Pedagogical, and Content Knowledge) developed by Mishra and Koehler (2006). The model offers a nuanced lens through which to explore the interplay between technological tools, pedagogical approaches, and subject-specific knowledge. It is particularly relevant in educational contexts where new technologies, such as VR, are introduced as part of teaching strategies. For this reason, TPACK is applied to clarify how the use of VR technology is linked to pedagogical considerations and professional knowledge in occupational therapy education.

Methodology

Two types of data were collected and used:

Evaluation Data in Teaching: Four VR-based teaching sessions and evaluations were conducted during the 2nd, 3rd, and 4th semesters. In collaboration with the educators responsible for these semesters, specific teaching themes were identified in which challenges had previously arisen in providing students with relevant and concrete examples. A suitable film was selected to serve as the basis for the subsequent teaching session. Following the VR experience, both students and educators were asked to complete a short questionnaire designed to capture their immediate experiences with the technology. The evaluation consisted of four open-ended questions aimed at eliciting the students' initial and spontaneous reflections. This approach aligns with qualitative methods that emphasize participants' firsthand perspectives and meaning-making, which are particularly valuable when exploring new or experiential forms of teaching (Kvale & Brinkmann, 2015). Five distinct films, each containing different professional content, have been tested. An overview of the films is provided in Table 1. Although the first session served as a pilot test, the evaluations from both students and educators have been incorporated into the present study, as no adjustments were made. The films have a duration between 1 minute and 8 minutes.

Workshop Data: A total of 36 occupational therapy students from all seven semesters of the program participated in a workshop where they experienced a selected film through VR headsets. All students watched

the same film, which depicted everyday life with dementia, including the thoughts and experiences of a person living with dementia, as well as the reactions and interactions of those around the person. Following the viewing, the students took part in a brainstorming session focused on potential applications of VR in teaching. Each student was asked to write down one idea per Post-it note and to contribute as many ideas as possible. The thematic categories emerged through an inductive process based on a qualitative reading of the students' written statements. This approach reflects principles of qualitative evaluation, where data is interpreted to uncover patterns of meaning (Kvale & Brinkmann, 2015).

Table 1: Descriptions of the five 360-degree films used

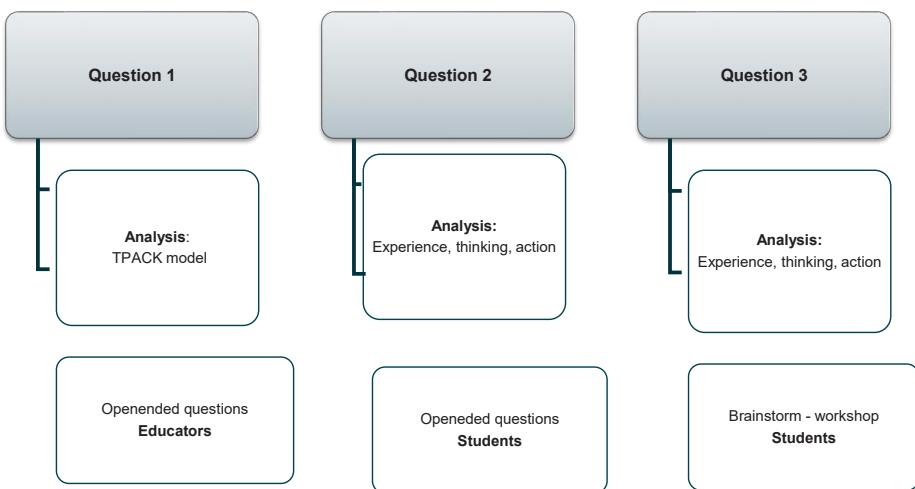
Heading of teaching session	Description of the film content
Film 1: 3 rd semester teaching, which addresses therapy in psychiatry practice.	Pilot test. A film depicting a meeting scenario in which a person with schizophrenia sees and hears individuals who do not exist in reality during a conversation with healthcare professionals. Through the immersive VR experience, students are placed in the patient's perspective, allowing them to feel what it is like to be in a situation where voices and visions appear vividly real. The aim is to highlight how difficult it can be to concentrate and engage in dialogue while experiencing intrusive and disturbing hallucinations.
Film 2: 4 th semester teaching, which addresses the use of assistive technologies and devices in occupational therapy practice.	This film was developed for use in community mental health services and aims to support individuals with social anxiety in training to take the bus. It includes various scenarios on the bus, such as boarding and sitting, while experiencing interactions, for example, with the bus driver or other passengers who speak to the viewer. The purpose of the film is to introduce students to technology (VR) used in clinical practice as a therapeutic and profession-specific tool.
Film 3: 2 nd semester teaching, which addresses activities of daily living (ADL) that may be experienced as intrusive and intimate.	This film depicts the concrete performance of bathing a patient lying in a hospital bed, where a healthcare professional carries out hygiene care of the patient's lower extremities. The patient is unclothed, and the film demonstrates how the procedure is conducted by hygienic principles. Through this film, students gain insight into what it means to be physically close to a patient who is dependent on assistance in intimate situations.

Heading of teaching session	Description of the film content
Film 4: 2 nd semester teaching, which addresses the planning and execution of patient interventions.	This film illustrates how a healthcare professional guides a hospitalized patient, admitted following a stroke or cerebral haemorrhage, through the process of washing their own face and upper body while seated in front of a mirror and sink. The film shows that the patient is experiencing both cognitive and physical impairments. It also highlights how the healthcare professional does not accommodate the patient's delayed responses.
Film 5: 3 rd semester teaching, which addresses cognitive challenges in daily life	This film portrays the experience of developing dementia from the perspective of the individual, as well as how it is perceived by close relatives such as a spouse and children. It illustrates the confusion and disconnection that can arise when the surrounding world attempts to communicate with a person affected by dementia.

Analysis

Two analyses were conducted to address the three specific research questions as well as the overall research question. The first analysis draws on the TPACK model to examine data based on educators' experiences testing VR films, aimed at providing students with a visual representation of 'the good example' in teaching during the early semesters of the occupational therapy education. The second analysis is guided by the three foundational analytical concepts of RPL: experience, thinking, and action (Horn et al, 2020, p.15), in the analysis of students' experiences with VR as an example of best practice, as well as their ideas for new potential applications of VR in occupational therapy education.

Figure 1: Visualisation of the analytical approach and type of data used to address the three research questions. (Figure conducted by authors)



TPACK model

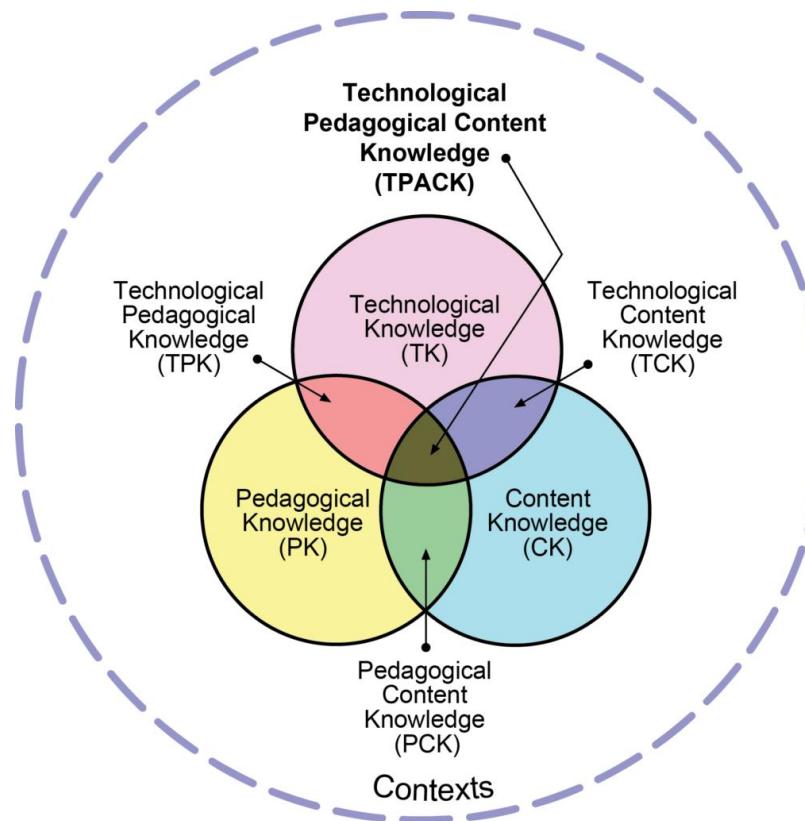
To analyse the data collected from the educators (research question 1), the TPACK model was used as an analytical framework. This model is designed to understand and evaluate the integration of technology in education by combining three key domains of knowledge:

- Technological Knowledge (TK) – knowledge of digital technologies and their potential.
- Pedagogical Knowledge (PK) – knowledge of teaching methods and learning processes.
- Content Knowledge (CK) – knowledge of the specific subject matter being taught.

The TPACK model helps to systematize and categorize the educators' experiences, providing an overview of which areas of knowledge were particularly emphasized during the teaching process. The data were classified according to whether the reflections primarily related to technological aspects (TK), pedagogical opportunities (PK), subject-specific content (CK), or the intersections of these domains in teaching practice.

For the evaluation data, the TPACK model was applied to identify how VR technology supports teaching in specific subject areas and to assess the pedagogical opportunities and challenges associated with its implementation. By using the TPACK model as an analytical framework, it was possible to evaluate how VR technology is integrated into teaching, what learning potentials it offers, and which challenges must be addressed to ensure effective implementation.

Figure 2: The Technological Pedagogical Content Knowledge (TPACK) model (Reproduced by permission of the publisher, © 2012 by tpack.org)



Results

The two types of data have been analysed in two parts. Part one (research question 1) presents an analysis of evaluation questionnaire of how educators who have tested VR in their teaching experience the interplay between technological, pedagogical, and professional knowledge (TPACK) concerning the integration of VR into occupational therapy education. Part two (research questions 2 & 3) focuses on students' evaluations of VR when used as 'The Good Example' of a practice situation within a teaching activity. This analysis is guided by three theoretical concepts: experience, thinking, and action. The concepts of experience and thinking are used to analyse data from the students' evaluations conducted after VR was tested in teaching, while action is informed by the ideas generated during the student workshop. All quotes from the evaluations and suggested ideas have been translated from Danish to English.

Part one: An analysis of educator data using the TPACK model

Technological Knowledge:

Using VR in teaching is new for all the educators participating in this study. They describe how they need to know the basics of how to operate the VR headset: turning it on/off, adjusting volume and straps, charging it, downloading films, understanding the need for internet, and managing the number of headsets used simultaneously. The educators find it important to be able to instruct the students thoroughly in how the VR headsets work, how long the film lasts, and how the startup screen appears. Students can sometimes hear each other's audio, which may be delayed and disruptive, so placements with as much distance as possible are preferable. Students using the headsets may face challenges, including dizziness, which should be managed by taking off the headset and switching to the educator's tablet, though with a slightly reduced learning experience.

Besides, the educators describe how it is important to have access to films relevant to the content of the teaching.

Content Knowledge:

The educators describe it as very important to be able to use films relevant to the theme of the teaching, making it relevant for the learning goals. The content must then be tailored to the specific theme of learning to support the students in experiencing and understanding how an

occupational therapist works. Besides, the students can be supported in learning to understand the situations of the citizens and their experiences of having a specific diagnosis. The educators' experiences are that through VR, the students can get a realistic impression of a situation without being physically present, thus avoiding the need to engage with the surroundings.

Pedagogical Knowledge:

The pedagogical framework used within this study and this organization (UCN) is RPL, including its models and learning principles. The educators express that VR complements with a new opportunity to modify their pedagogical methods. Additionally, the students are experienced as having an increased engagement when working further with the subject after seeing the VR film.

Technological Pedagogical Content Knowledge:

The educators state the importance of including relevant films at this point in the teaching process and to ensure they align with the purpose of the teaching theme. Technology, content, and pedagogy must be consistent and coherent.

Furthermore, it is essential to present to the students what the film will be used for, what they are expected to learn from it, and what the focus should be during the film.

The educators experience that the same film can be utilized for various lessons and content themes. For example, a film about bed bathing can provide an experience of both being in a room with an elderly person who is naked, instruct on how such a situation should be handled, or focus on the communication between the professional and the citizen.

Context:

In the TPACK model, the analytical components are situated within a broader contextual framework, emphasizing that the successful integration of technology in teaching is also shaped by contextual factors. These factors identified by educators during VR testing indicate several practical considerations for an effective implementation of VR in teaching. First, the selected films must be downloaded in advance onto the VR headsets, as streaming is not otherwise feasible when multiple students need to view the same film simultaneously. Second, all VR head-

sets must be fully charged before the teaching session. Third, a stable and high-quality internet connection at the teaching location is crucial. Currently, only one classroom set of 38 VR headsets is available, which makes it necessary for educators to reserve the equipment in advance. To support this process, an accessible and user-friendly booking system is required. These considerations highlight the importance of technological infrastructure and logistical planning as key contextual factors in educational technology integration (Mishra & Koehler, 2006).

Part two: An analysis of students' evaluations and new ideas when VR is used as 'A Good Example'

Figure 3: Results of students' evaluations and new ideas when VR is used in teaching

Experience	Thinking	Action
<ul style="list-style-type: none"> • The realistic setting supports the learning • A safe and secure experience • An opportunity to observe the surroundings • Compared to having a visit from a citizen or having "hands-on" 	<ul style="list-style-type: none"> • Connection to theory and clinical practice • Supports understanding and remembering diagnoses and patient groups • The ability to reflect on one's experiences 	<ul style="list-style-type: none"> • Visualizations from an occupational therapist's perspective • Visualizations from a client perspective • Occupational therapy theory and assessments • Additional ideas/perspectives

With the learning principle of 'The Good Example', the VR film provides the students with a relevant example of a realistic situation relevant to the teaching theme, and to be discussed afterwards. The students' evaluations and new ideas are connected to experience, thinking and action in the following.

Experience

The students gain valuable experiences from watching a film of a realistic and relevant scenario through VR. The experience created a feeling of presence, enabling students to imagine themselves in the scenario safely and securely. Furthermore, to observe and reflect on how healthcare

professionals handle situations and interact with patients. Four themes appeared concerning experience:

The realistic setting supports the learning

“It was possible to see how other healthcare professionals handle a situation, what they do, what they say, how the citizen reacts, etc. It provides good learning to see it happen and reflect on the experience, rather than having to read about it.”

“To have a real experience with it, where you can imagine that you are right next to it. Here you might get ideas about what you could do to help. Because you feel like you are in it yourself.”

A safe and secure experience

“A safe way to push some boundaries, as you can always just take off the VR glasses.”

“It provided a realistic experience. Gave a feeling of being present, and yet not.”

An opportunity to observe the surroundings

“As you can look around in the surroundings, it also gives a more realistic feeling, similar to observing in clinical practice.”

Compared to having a visit from a citizen or having “hands-on”

“Learning with VR provides insight into how a disease or condition can affect someone, similar to when we have a citizen come to the school to talk about their disease or condition.”

A few students noted that they experienced dizziness while wearing the VR headsets and were therefore unable to watch the videos through them. As a result, they had to view the videos on the tablet.

Thinking

Visual and firsthand experiences improved memory retention and comprehension, fostering empathy and a deeper understanding of patient experiences. Watching realistic films supported the students in understanding different patient groups and thereby preparing them for re-

al-world situations. Besides, to think critically about their potential actions and interventions. Three themes appeared concerning thinking:

Connection to theory and clinical practice

“It can mean that you get real images to accompany the theory we learn. Gain an understanding of how to approach things in practice and understand different patient groups. It is good preparation before going out into the real world.”

“Well, it gives me a better insight into what it means to be affected by a disease, condition, or other issues that are relevant to us as occupational therapists. Also, what one might work with when they are fully qualified.”

Supports understanding and remembering diagnoses and patient groups

“It can provide a more visual learning experience that is better remembered because you experience it firsthand.”

“It means that I can understand what people with schizophrenia are talking about when they describe their experiences.”

“You might better be able to put yourself in the patient’s place and understand the challenges they may experience.”

The ability to reflect on one’s experiences

“I found it exciting to experience it firsthand. It has led to some reflections on how we can use VR in practice.”

Action

The ideas created at the workshop demonstrate the possibilities of different perspectives in actions connected to VR in teaching. The collected post-it notes from the workshop were analysed and categorized into four overarching themes: 1) Visualizations from an occupational therapist’s perspective. 2) Visualizations from a client perspective. 3) Visualizations that demonstrate how occupational therapy theories and assessments can be applied in practice. 4) Additional ideas and perspectives.

1) Visualizations from an occupational therapist's perspective:

- Instead of written cases, a person in a VR film may be more realistic for following group work e.g., connecting the person in the film to a relevant theory.
- Concerning work environment as a topic – make visits to different workplaces.
- An occupational therapist working with different kinds of clients.
- Insight into handling 'boundary-crossing' tasks such as bathing.
- Insight into different kinds of homes, e.g., social psychiatry or hospital.

2) Visualizations from a client perspective:

- Insights into experiences of everyday life when living with different kinds of diagnoses and functional impairment, such as delusions, hallucinations, obsessive thoughts, memory, sensory intolerance, aphasia, and apraxia.
- Become better at understanding relatives.
- Walking alone in the street, and everybody looks at you.

Occupational therapy theory and assessments:

- Practice the use of occupational therapy assessments.
- Make observations of clients performing daily activities in their environment.
- For practicing activity analysis.

Additional ideas/perspectives:

- Pathology and the connection to clinical practice.
- Support learning first aid.
- Occupational therapy laboratory working with communication.

Overall, the VR experiences support RPL by providing realistic insights into practice, making learning easier and more engaging compared to traditional classroom teaching. It offers a safe and secure environment where students can observe and interact with their surroundings, akin to a hands-on experience or having a visit from a citizen. The VR experience enhances thinking by helping students empathize with citizens, prepare for clinical placement, understand and remember diagnoses,

and connect theory to practice. It also encourages reflection and deeper engagement with the material. The actions taken during and after the VR experience involve discussing insights with peers and using the VR scenarios across different patient groups. These activities reinforce the learning process, making it more comprehensive and effective.

Conclusion

This study set out to explore the overarching question: How can Virtual Reality be meaningfully integrated into occupational therapy education to support learning in line with the principles of Reflective Practice-Based Learning? To address this, three sub-questions were formulated, examining: (1) how educators experience the interplay between technological, pedagogical, and professional knowledge (TPACK) in integrating VR into teaching; (2) how occupational therapy students experience the integration of VR in their education; and (3) what new applications for VR students envision after testing it. The findings highlight the multifaceted potential of VR in occupational therapy education. Educators perceived the integration of technological, pedagogical, and professional knowledge as a dynamic and evolving process that demands not only technical competence but also alignment with pedagogical aims and professional content. Students found the VR experience engaging and meaningful, offering an alternative way to connect theory and practice. The immersive and realistic nature of the VR scenarios functioned as 'The Good Example,' providing a shared reference point that stimulated reflection and informed classroom discussions. Furthermore, students identified potential new applications for VR in occupational therapy education, particularly in patient communication, assessment training, and environmental awareness.

However, the findings also indicate important considerations for future implementation. Some students experienced discomfort when wearing the VR headset, underscoring the need for alternative formats that provide comparable practice-based experiences. Moreover, the study does not address how students' perceptions of VR might evolve, particularly once the novelty effect diminishes. Taken together, these findings suggest that VR holds significant promise as a pedagogical tool within occupational therapy education, while also underscoring the need for further research to examine its impact over time. As this represents an initial

exploration, future studies on a larger scale are needed to determine how VR can be most effectively and inclusively integrated into teaching practice.

Future perspective

One promising avenue involves testing a new feature currently under development: an AI-driven avatar that can be integrated into the VR environment. This avatar would enable students to engage in simulated patient interactions, where both educators and students can prompt the avatar to embody a specific patient profile with concrete challenges. Such a feature could enhance students' clinical reasoning, communication skills, and ability to tailor interventions to individual needs. Investigating how this interactive element can support learning outcomes and enhance the realism of training scenarios could serve as a foundation for future pilot studies and research projects. These initiatives would align with and contribute to the development of a new thematic focus in the revised curriculum for occupational therapy education programmes in Denmark (UCN, 2024).

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Generative AI in Reflective Learning: Bridging Literacy Gaps

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Abstract

In further education, barriers to scientific knowledge often arise due to limited competence in reading and comprehending complex academic literature. This study investigates the potential of generative artificial intelligence (AI) to scaffold reflective practice-based learning by assisting learners in overcoming these barriers by embedding generative AI within professional training. This research highlights a pathway for re-engaging adult learners with academic discourse, offering scalable solutions for lifelong learning in an era of rapid technological change. Specifically, we explore whether generative AI can enhance the accessibility of scientific literature, thereby supporting professional development through improved technological literacy. The research employed a mixed-methods approach, combining questionnaires and semi-structured interviews. The questionnaire assessed the learners' perceived difficulty in engaging with academic papers. At the same time, the interviews delved into the effectiveness of generative AI assistance and its integration into their professional practice. Initial findings suggest that generative AI can act as a scaffolding mechanism, providing simplified translations and interpretations of complex texts. This support helps learners to understand and apply scientific content in their contexts. These results highlight the potential of generative AI in enhancing reflective practice-based learning by bridging gaps in scientific literacy, ultimately contributing to the future of practice-oriented education in an era shaped by disruptive technologies.

Keywords

Generative Artificial Intelligence; Reflective Practice-Based Learning; Scientific Literacy; Technological Literacy; Lifelong Learning; Adult Education; Cognitive Scaffolding.

Introduction

Engaging critically with scientific literature in contemporary professional education is fundamental for fostering reflective and evidence-based practice. However, many adult learners, particularly those returning to education after years of professional experience, encounter significant barriers when faced with the complexity of academic texts (Stiglic et al., 2023). These challenges are not solely rooted in scientific literacy but also in the broader difficulty of navigating across domains and languages (Laal & Laal, 2012; Oriji & Uzoagu, 2019; Storey & Wagner, 2024). Learners must often bridge the gap between academic theory and professional practice, between general research findings and specific local or disciplinary contexts. In the context of reflective practice learning (RPL), engaging with academic literature is not just an academic skill but a central component of professional development and identity formation. Theory and academic texts within RPL are not static or abstract but deeply contextual and dialogic. To work meaningfully with theory, students must critically engage with academic texts as tools for sense-making, transformation and reflection. However, this engagement is often complicated by barriers such as linguistic challenges and registers, mainly when English-language literature is applied in non-English speaking professional environments. Developing the capacity to navigate academic literature, therefore, becomes essential for working with theoretical content as knowledge-in-action. In this understanding of RPL, it is not enough to just read the text; instead, the student must question, reinterpret and apply theoretical insights in authentic professional contexts, supporting a kind of epistemic agency, critical reflection and lifelong learning that RPL seeks to cultivate. As the demands for continuous professional development intensify in the face of rapid technological and societal change (Cacicco & Riggs, 2023), the limitations imposed by these cross-domain and cross-language challenges pose a significant threat to the effectiveness of lifelong learning (Laal & Laal, 2012). Practitioners risk falling behind in adapting to evolving professional standards and practices without

the ability to translate and transfer knowledge across these boundaries. In parallel, the emergence of generative artificial intelligence (AI) offers new opportunities for supporting learners in overcoming such barriers (Lee & Palmer, 2025). illustrates, AI is often integrated into professional tasks without being explicitly addressed, leaving learners unprepared to reflectively engage with AI tools for tasks like translation, information analysis or scientific reading (Cacic & Riggs, 2023; Li et al., 2024). While AI has increasingly been integrated into educational contexts, its potential as a scaffolding mechanism (Lee & Palmer, 2025; Shanto et al., 2025) to support reflective practice-based learning in professional development remains underexplored. Generative AI's capacity to translate, simplify, and adapt knowledge (Cacic & Riggs, 2023) across domains and languages presents a promising pathway for re-engaging adult learners (Li et al., 2024) with academic knowledge and enhancing their technological literacy (Joshi, 2025). However, unlocking this potential is contingent on more than just access to AI tools; it requires learners to develop the technological literacy necessary to engage with AI critically and confidently (Cacic & Riggs, 2023; Storey & Wagner, 2024). As AI systems become deeply embedded in professional workflows, learners must move beyond surface-level familiarity and acquire a reflective understanding of how these tools function, what assumptions they make, and where their limitations lie (Lee & Palmer, 2025; Stiglic et al., 2023). Without this foundation, learners risk becoming passive recipients of AI-generated information, relying on outputs without questioning their relevance, accuracy, or appropriateness, especially when interpreting complex scientific literature (Stiglic et al., 2023; Storey & Wagner, 2024). Such uncritical use weakens reflective practice and may contribute to the misapplication of knowledge in professional settings (Storey & Wagner, 2024). In contrast, learners who develop technological literacy are better positioned to exercise professional judgment regarding when and how to apply AI effectively and, equally important, when not to. This knowledge empowers them to use AI as a catalyst for learning (Shanto et al., 2025) rather than a crutch, enabling them to actively interrogate AI-generated outputs and integrate them meaningfully into their reflective practice. Technological literacy fosters learner confidence and agency by reducing blind trust in AI systems and unwarranted scepticism, promoting a balanced and responsible engagement with technology (Lee & Palmer, 2025). This study investigates the research question: “*Can generative AI*

bridge the gap between learners and scientific literature and the broader gaps that emerge when crossing domains and languages in professional learning?”

Using a mixed-methods approach, we combine questionnaire data on learners' challenges with academic texts and semi-structured interviews exploring the value and integration of AI tools in professional contexts based on the Kirkpatrick framework (Kaufman, 1996). The data is based on learners attending an AI course. Our findings contribute to the growing discourse on the role of AI in education, offering insights into how generative AI may be leveraged to advance reflective practice-oriented learning in an era defined by technological transformation (Joshi, 2025).

Methods

To provide a meaningful context for the research, this section outlines the design and delivery of the AI course from which the study draws its empirical foundation. The aim is not to evaluate the course itself, but to describe the educational setting, purpose and core activities in which the data were generated. The section offers insight into the learning environment that shaped participants' experiences with generative AI and reflective practice by presenting the didactic design, intended learning outcomes and learning activities.

Flyvbjerg (2006) emphasises that selecting case studies should facilitate an in-depth understanding of events and phenomena within their natural and holistic settings, ideally with minimal researcher interference (Flyvbjerg, 2006). Case studies are particularly valuable for examining dynamic social interactions and developments, especially in complex environments where people and technologies intersect. This makes the method well-suited for exploring how students engage with and utilise chatbots, as it accommodates multiple data collection strategies and supports methodological triangulation. Yin (2013) offers a systematic framework for conducting case study research, covering design phases, data gathering, analysis and reporting. Nonetheless, not all information gathered may be in written form and the interpretation of findings often relies on professional judgement and contextual awareness. The resulting case narratives serve as empirical documentation, usually structured around key themes or central narratives that guide the analysis (Yin, 2013). The resulting case

narratives serve as empirical documentation, usually structured around key themes or central narratives that guide the analysis Yin (2013).

Case Description

To investigate the research question, the following course was used as a case.

Didactic Design

The course was delivered in person over seven full days, spaced a week apart, to a diverse group of adult learners engaged in Vocational Education and Training. Participants brought a broad spectrum of educational backgrounds and professional experience, ranging from those without prior AI exposure to seasoned IT professionals. This heterogeneity called for a flexible and inclusive didactic approach, capable of addressing learners' starting points while enabling shared exploration (Hiim & Hippe, 2015; Merrill, 2015).

The teaching design was grounded in the principles of reflective practice-based learning, particularly Fundamental Principle No. 3: Exploration and Fundamental Principle No. 4: The Good Example (*White Paper on Reflective Practice-Based Learning*, 2020)2020. The pedagogical intention was to create a learning environment where the learners could engage with complexity through reasoning, experimenting, hypothesising and critically reflecting on AI outputs and their applications to real-world contexts. This design acknowledged that meaning-making often emerges when prior knowledge is challenged or disrupted, or 'a breakdown of meaning' (Weick & Weick, 1995), and also following chunking of the new insights with the existing knowledge (Oakley, 2014). In this course, such breakdowns frequently occurred when AI responses didn't meet learner expectations and caused a cognitive conflict, prompting deeper inquiry into how generative systems work and how outputs should be interpreted, questioned or refined. The lecturer played an active facilitative role throughout this process. When confusion arose, instructors supported learners by explaining and guiding them to explore why an AI system might respond in specific ways (Shanto et al., 2025). Learners critically evaluated AI outputs, integrating new information with existing knowledge using realistic professional examples as anchors for reflection (inspired by Plan-Do-Study-Act and RPL Principle 4). Generative AI tools like ChatGPT were explicitly taught, focusing on strategic knowl-

edge gathering and treating AI as a critical thinking partner. Collaborative learning occurred in small, stable groups, fostering inquiry and peer feedback, with cross-team knowledge sharing. The approach balanced structured tasks with open, AI-assisted personal **inquiry for a** reflective, exploratory experience.

Purpose

The course primarily aimed to equip adult learners with practical skills and technological literacy to integrate generative AI into their professional work. Emphasis was on hands-on application using their own use cases for immediate relevance, positioning knowledge as foundational for applied competence (experimenting, evaluating outputs, prototyping). A key secondary goal was fostering a reflective mindset questioning AI, triangulating information to enable responsible and meaningful AI use in complex settings. The course implicitly aimed for workplace skill transfer, hoping learners would become AI catalysts, and supported autonomous learning by encouraging AI use with unfamiliar knowledge. Learner motivation aligned with this application-focused approach.

Activity

Learning activities emphasised situated, hands-on exploration, applying generative AI to real-world professional challenges. The central task was developing an AI proof-of-concept prototype for their workplace. An iterative, PDSA-inspired process encouraged critical reflection on AI outputs, using unexpected results as learning opportunities ('How to check?', 'How to integrate?'). Prompt engineering was taught as a core literacy for effective AI interaction. Learners used ChatGPT-4o by uploading both provided and self-selected materials, iteratively refining prepared prompt templates for translation, summarisation and analysis. For RAG (retrieval augmented generation) workflows, they worked in Langflow, using OpenAI's embedding model and a DataStax-provided vector database to query domain-specific documents. Collaboration was key, moving learners from guided experimentation to autonomous innovation. All materials provided were selected to avoid any copyright infringement, ensuring compliance with intellectual property regulations. In parallel, participants were introduced to the principles of responsible content use. Ethical and legal considerations were explicitly addressed during the course, including discussions on General Data Protection Regulation compliance, data

privacy and responsible handling of personal information. Learners also explored issues such as copyright, intellectual property rights and the ethical implications of AI-generated content, including deepfakes and potential misuse in professional contexts. This exploration was performed in both casework and discussion. These elements were integrated into reflective activities to ensure that participants developed both technical competence and an awareness of the broader societal responsibilities.

Data Collection

This study draws on a combination of qualitative and quantitative data and empirical insights generated through the researchers' dual role as lecturers and observers during the course. By collecting data at multiple stages and from numerous sources, the design enables a triangulated understanding of learner engagement, technological literacy development and the practical integration of generative AI into professional practice. Furthermore, the evaluation followed the Kirkpatrick Framework, stating that the course satisfaction, the learning outcome, the application of learning after the course and the results within the enterprise should be examined to deem a course or another upskilling activity a success (Kaufman, 1996).

Questionnaire on Engagement with Academic Literature

On the first day of the course, participants ($n=8$) completed an anonymous questionnaire to assess their perceived challenges when engaging with scientific and complex English-language literature. The questionnaire consisted mainly of closed-ended questions, supplemented by a single open text field for elaboration. The purpose was to better understand learners' starting points concerning reading and applying academic knowledge.

Thematic categories included:

- Confidence and reading comfort concerning academic or technical English.
- Sources of difficulty, such as language barriers, unfamiliar terminology or complexity of content.
- Impact of linguistic barriers on motivation and ability to apply knowledge.

- Current strategies used to make sense of complex or unfamiliar texts.
- Perceived importance of accessible academic literature for learning and professional development.

Midway Evaluation of Learners' Own Perceived Knowledge Gain

At approximately the midpoint of the course (session 4 of 7), a short-written evaluation was conducted to assess learners' self-perceived development concerning course objectives. The purpose of the evaluation was both formative and diagnostic, allowing the lecturers to adjust the learning trajectory and gain early insight into how participants experienced their learning progress.

Formal Examination

Three weeks after the final course session, learners completed a formal examination consisting of an individual presentation of their AI prototype. The examination assessed how learners had translated their knowledge and skills into a working proof-of-concept relevant to their practice. This material serves as both a validation of learning outcomes and a data point for understanding how learners integrated AI into their professional thinking and application.

Final Course Evaluation

After the course, participants completed a formal evaluation of the overall course experience. This included both structured satisfaction ratings and opportunities for open feedback. Although not central to the study's primary research question, this data provides valuable context for understanding the learners' perceived value of the course, including how the didactic design and AI tools supported their engagement and learning.

Semi-structured Interviews

Three months after the course ended, follow-up interviews were conducted with three participants who signed up voluntarily. The interviews were designed to explore how learners had applied generative AI in their professional settings and how the tools had influenced their thinking or reflective practice. An interview guide was developed for this purpose, inspired by Kirkpatrick's evaluation framework, focusing on transfer and

behaviour. Each interview lasted 10–15 minutes and was recorded for transcription and subsequent thematic analysis. No participants were preselected based on background or experience.

Empirical Knowledge

The interviews were conducted by the research team, who also lectured during the course. Hence, the study includes an additional layer of empirical documentation, drawn from the researchers' observations and interactions during the sessions. This role required reflexivity to balance facilitation with data collection. All participants provided informed consent, and all data were collected, stored and used following ethical guidelines.

Analysis

To analyse the qualitative data, this study applied the Gioia Method, an approach to develop grounded theory based on empirical observations (Gioia et al., 2013). The Gioia Method offers a structured process for identifying patterns and building conceptual insight from qualitative data, especially interview transcripts. In this study, the process unfolded as follows:

In the initial stage, open coding was used to identify recurring concepts, expressions and themes across the semi-structured interviews. These first-order codes were closely tied to the participants' language and experiences, particularly concerning their use of generative AI, reflections on trust and accuracy, learning challenges and perceived impact on their professional practice.

In the second stage, the first-order codes were grouped and organised into second-order themes, representing the mechanisms through which learners engaged in reflective practice and integrated AI into their work. These themes were also related to technological literacy, critical engagement and cross-domain knowledge transfer. Particular attention was paid to how these mechanisms corresponded to the dimensions of Kirkpatrick's model and RPL concepts.

In the final stage, the axial themes were synthesised into a higher-order conceptual framework, connecting the learner narratives to broader theoretical perspectives on reflective learning, AI-supported knowledge scaffolding and absorptive capacity. This synthesis was used to generate insights about how generative AI can support adult learners in overcom-

ing barriers to engaging with scientific knowledge, such as 'foreign language'.

Results and Discussion

All learners finished the course and participated in pre-, mid-term and final evaluations. They expressed satisfaction with the course topic and design. No students failed the exam: The first two Kirkpatrick levels persisted.

On the first day, participants ($n = 8$) completed an anonymous questionnaire to assess their perceived challenges when engaging with scientific and complex English-language literature. The questionnaire consisted primarily of closed-ended questions, supported by open text fields to elaborate on specific experiences. The aim was to capture learners' baseline confidence levels, perceived barriers and strategies for academic content.

Reading Comfort and Comprehension Challenges

The responses reveal that half of the participants reported feeling uncomfortable when reading English-language scientific or complex texts. Three participants described themselves as comfortable or very comfortable. One remained neutral. Open responses indicated that complexity of the literature, specialised terminology and difficulty in understanding technical vocabulary were frequent sources of frustration. One explicitly noted:

'I quickly lose the overview if the topic is unfamiliar or if the text mixes languages, which often happens.'

Motivational Impact of Language Barriers

Although three participants reported that language barriers did not affect their motivation, the remaining five identified clear negative impacts. These ranged from decreased willingness to engage with unfamiliar material to increased cognitive load and avoidance behaviour. One participant wrote:

'It takes more energy, and I know there will be parts I don't understand.'

Another noted how using tools like Google Translate is often ineffective when content becomes too technical.

Strategies for Understanding Complex Concepts

When asked about current strategies used to handle complex or unfamiliar terms in English-language texts, the most frequently mentioned tool was online translation services (used by 50% of respondents). A smaller number reported using dictionaries (13%), while none indicated they discuss the material with others. Notably, three participants selected 'Other', and described ad-hoc methods, such as rereading sections or relying on prior knowledge. This suggests a lack of collaborative or structured strategies for dealing with complex literature.

Perceived Importance of Accessible Literature

Significantly, seven out of the eight respondents believed that access to understandable academic texts significantly influences their learning process and professional development. Half (four out of eight) indicated that it impacts their growth to a very high degree, while two reported a moderate impact and only one participant felt neutral. No one selected 'not at all'. These findings underscore the relevance of designing learning environments that scaffold access to complex information, especially regarding academic or research-based knowledge. The data also supports the course's emphasis on using generative AI as a practical, explorative tool to bridge language and domain-related barriers in reading comprehension.

Data Analysis

The Gioia analysis revealed four interconnected dimensions that shed light on how generative AI was used as a scaffold within the learning environment. These are shown in figure 1. The first-order concepts build on statements from the data, and are collated to second-order themes, and again aggregated to dimensions.

AI as a Cognitive Scaffold

Across all three interviews, learners described how generative AI supported their ability to access, comprehend and apply knowledge they would otherwise have struggled to engage with. Participants reported using AI to simplify complex or technical texts, extract key information and generate summaries tailored to their context and level of understanding. One respondent emphasised how AI allowed him to interact with research articles at multiple levels of depth and in different formats, while another highlighted how she now used AI to process dense internal documents far more efficiently than before. These findings suggest that AI reduced cognitive barriers in relation to academic literature or unfamiliar domains and functioned as a tool for contextual adaptation.

Reflective Learning and Knowledge Exploration

A second dimension captured the ways learners used AI to receive information, and to engage in reflective inquiry. Participants experimented with prompting strategies, adjusted outputs based on audience and purpose, and developed workflows. One respondent described how she created and refined her prompt templates, which she used in job search and professional communications. Respondents also discussed how AI enabled them to engage with new domains (e.g. programming or visual modelling) that previously felt out of reach. Importantly, participants also demonstrated awareness of AI's limitations and expressed the need to evaluate the credibility and usefulness of its output, especially in professional contexts. This reflection was often grounded in their domain knowledge, supporting the idea that technological and domain literacy mutually reinforced one another.

Application and Integration in Professional Practice

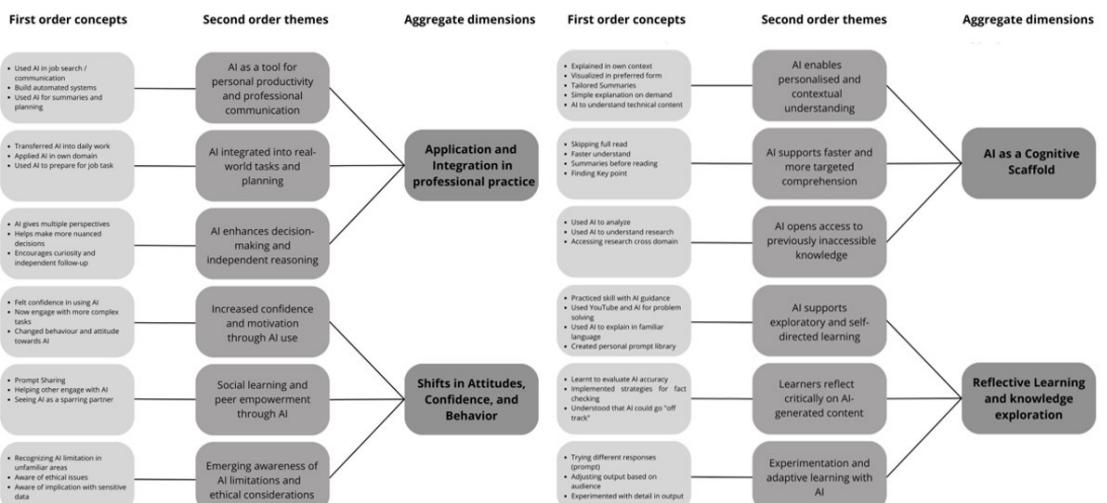
Learners did not treat AI as a theoretical tool but integrated it into concrete professional activities. Examples included using AI to write job applications, summarise policy documents, prepare meeting notes and analyse legislative constraints. One respondent even used AI to automate basic workflow processes, such as transcription and compliance checks. This dimension illustrates how learners moved beyond curiosity and incorporated AI meaningfully into their daily tasks. AI's perceived value increased when it was seen to accelerate tasks and enhance the quality of decisions and communication. In this way, learners actively bridged

the gap between knowledge and action between academic or abstract content and practical, situated application.

Shifts in Attitudes, Confidence and Behaviour

Finally, the analysis revealed important affective and behavioural shifts. All participants described growing confidence, motivation and curiosity as they engaged with AI. For one of the respondents, AI enabled her to explore new topics she would previously have avoided, such as research on migraine, technical fabrics or visual diagramming tools. Another reported feeling increasingly confident in explaining AI to others and encouraging them to use it. Learners reflected on ethical concerns and the boundaries of AI usage, especially in relation to privacy and domain limitations, suggesting the development of a more balanced and critical stance. In several cases, participants began acting as informal AI advocates within their own networks, sharing prompts or advising peers on best practices. These changes suggest that AI use catalysed technical competence and attitude shift.

Figure 1: Results from the Gioia Analysis, with first-order concepts, second-order themes and aggregated dimensions



Discussion

This study highlights how generative AI can function not merely as a technical tool but as a cognitive scaffold that enables adult learners to re-engage with complex scientific literature in meaningful, reflective ways. While learners initially reported low confidence in reading academic text, particularly in English and unfamiliar domains, the integration of generative AI opened new entry points to knowledge that would otherwise have remained inaccessible. In this way, it shows potential to increase the temporal dimension of near transfer, as the new knowledge can be put into perspective swiftly in situations where other dimensions are altered: e.g. the physical context is far from the application area or where the social setting differs (Aarkrog, 2011).

A key insight is that AI did not replace understanding but enabled it. Rather than providing simple answers, AI supported an iterative, exploratory learning process. Participants used AI to simplify, translate and summarise difficult texts, but crucially, they also experimented with prompts, questioned the outputs and adjusted based on context and audience. These behaviours reflect growing technological literacy, not just technical skill. In this sense, AI became both the object of learning and the medium for learning. This dual role aligns with iterative and reflective learning approaches, where knowledge is constructed through questioning, failure and re-framing cycles. Hence, it enables the chunking of ideas and relates them to prior knowledge (Oakley, 2014). The chunking process also takes place when the learner engages in diffuse-mode thinking, not focusing on the task, and how generative AI contributes to this process remains an open question. However, the ability does demonstrate that connections between the prior knowledge of the learner and the new topic are vital to aid later application of new knowledge and later integration into the everyday work-life of the learner (Merrill, 2015). While AI can support and accelerate comprehension, it does not eliminate the need for foundational domain knowledge. Participants themselves emphasised that their ability to critically evaluate AI-generated summaries or translations depended on having at least a basic understanding of the subject matter. They described how they now often skip full readings in favour of AI-generated summaries, which streamlined their workflow, yet they also acknowledged the risks of accepting such outputs at face value. This highlights a potential trade-off where efficiency may come

at the cost of depth and correctness, underscoring the importance of equipping learners with strategies to manage potential AI inaccuracies. Thus, domain expertise and verification strategies remain essential components of responsible AI-supported learning. This concern about efficiency coming at the cost of depth is echoed in emerging research on the cognitive consequences of outsourcing learning processes to a machine. Studies suggest that over-reliance on AI, particularly in the early stages of learning, may lead to 'shallow encoding' of information. When learners outsource the heavy cognitive lifting – such as summarisation and synthesis to an AI, they risk failing to internally integrate the knowledge, which can impair long-term recall, critical thinking and a sense of ownership over their learning (Kosmyna et al., 2025). This highlights a crucial point: generative AI is a powerful tool, but it does not replace the need for foundational domain knowledge, nor can it bypass fundamental learning principles like Vygotsky's zone of proximal development. Learners must still build upon an existing cognitive framework. While AI can act as an effective scaffold to help navigate complex material, it cannot substitute the mental effort required to form durable memory traces. The danger is that the convenience of AI may reduce a learner's inclination to critically evaluate outputs or engage in the deeper, more effortful thinking that is essential for robust understanding. Therefore, pedagogical framing is paramount. To mitigate these risks, educators must position AI not as a shortcut to bypass learning but as a reflective partner that complements and deepens rather than replaces the development of core knowledge and critical inquiry skills.

The interviews further demonstrated how learners integrated AI into professional practice. They moved beyond using AI for individual tasks and began creating workflows, adapting outputs to workplace challenges and even guiding others in AI use. This transfer into an applied context signals that generative AI helped close the gap between theory and practice, between academic knowledge and professional relevance. In some cases, learners began acting as internal drivers of change in their organisations, suggesting that AI use fostered personal development and organisational absorptive capacity. This could be a driving factor for developing absorptive capacity, by enabling social integration and easing knowledge assimilation and transformation within organisations (Lane et al., 2006; Todorova & Durisin, 2007; Zahra & George, 2002).

Significantly, the emotional dimension also shifted: participants described increased confidence, curiosity and willingness to engage with complexity. This suggests that generative AI did not just reduce barriers to access; it increased motivation and agency, enabling learners to take ownership of their learning and apply it more broadly. This targets the trouble that learners with prior negative educational experience feel when enrolled in upskilling, by lowering the language entry barrier to new domains (Decius et al., 2021) we developed a conceptual framework of antecedents, processes, and learning outcomes of IWL among blue-collar workers (APO framework). Similar effects have been seen for other work-easing technologies, e.g. robot implementation, where employees become familiar with the technology, apply it in relevant circumstances and start to appreciate it (Stingl et al., 2024).

This study suggests that when embedded in reflective, practice-oriented learning, generative AI can:

- Lower the threshold for accessing complex, domain-specific knowledge.
- Support experimentation and critical engagement with content.
- Enhance learners' ability to transfer insights into professional action.
- Contribute to longer-term shifts in confidence, motivation and peer learning.

These outcomes point toward a broader role for generative AI in professional education not as a shortcut, but as a catalyst for deeper learning, self-direction and professional adaptation in the face of rapid technological change. Under the right circumstances, it can be used as a reflective artefact by the learner.

The findings of this paper have several limitations. As this paper is positioned within the explorative phase of AI in education, both the data collected and the conclusions drawn could be enhanced by later knowledge acquired in the field. Furthermore, the data were collected from a small sample of students, and they were free to report and exemplify their gains themselves without control of actual implementation. These data were collected partly by the educators, which can also be a point for improvement in later works.

Conclusion

In conclusion, this study answers the research question of whether generative AI can support adult learners in overcoming barriers to scientific literacy within professional education and lifelong learning. By embedding generative AI in a reflective, practice-oriented course design, learners could simplify and interpret complex academic texts and develop strategies for critical engagement. Furthermore, they could also transfer knowledge into real-world contexts, exploiting the knowledge. The findings suggest that generative AI can serve as a scaffold and a catalyst for reflective learning, enabling learners to reframe challenges, test assumptions and construct knowledge through interaction. Generative AI is a technology that might contribute to the overall learning curve. It reduces the barrier to learning new knowledge and applying it in professional education.

Participants reported increased confidence, motivation and independence in navigating unfamiliar domains, demonstrating that generative AI's impact extends beyond technical assistance. It supports learners' broader development as reflective practitioners capable of using AI meaningfully and responsibly in their professional lives. The dual role of generative AI, as both subject and instrument of inquiry, appears to facilitate iterative learning processes and strengthen technological literacy, especially when integrated into structured, exploratory learning environments. As such, generative AI holds significant promise for addressing persistent barriers in lifelong learning and enabling more equitable access to knowledge in technologically evolving professions.

While not the central focus of this study, legal and ethical considerations became increasingly prevalent as participants engaged with AI. Questions surrounding intellectual property rights, data protection under GDPR and the implications of emerging regulations like the EU AI Act surfaced naturally in discussions and reflections. These concerns underscore the need for awareness and competence in navigating the legal landscape of AI use. As AI becomes embedded in professional routines, educational initiatives must not only foster technical literacy but also cultivate ethical sensitivity and regulatory awareness to ensure responsible and compliant use.

This study shows that generative AI can enhance learners' ability to access and apply complex knowledge. While replacing reflection with

generative AI is impossible, the results show that AI interactions support critical thinking, contextual adaptation and professional judgment. The following implications build on these insights and are grounded in the principles of RPL, where generative AI can be used to increase iterative, reflective processes. Hence, educators should position generative AI not merely as an assistant for content delivery but as a reflective partner that supports knowledge exploration and cognitive scaffolding. It remains an open question whether generative AI can act as both simultaneously. Learners interacting with AI through iterative prompt refinement and critical questioning activate deeper thinking processes and engage in hypothesis testing, core to reflective practice and iterative learning. These interactions can lead to conceptual breakthroughs, aligning with the theme of AI as a cognitive scaffold. From an RPL perspective, such moments represent 'suitable disturbances' that open opportunities for insight, theory-practice integration and personal meaning-making.

In this study, learners benefit most when generative AI instruction simultaneously develops their understanding of AI systems and their ability to apply insights critically within their professional domains. This dual development reflects the theme of application and integration in professional practice, where learners move from using AI instrumentally to embedding it in workflows, communication and problem-solving. RPL's emphasis on handling real-world complexity through reflection and action is echoed in scaffolded activities that ask learners to examine AI limitations, test ethical boundaries and validate outputs concerning their specific contexts. These activities reinforce technological and domain literacy and strengthen learners' reflective judgment.

The use of generative AI in education raises important questions about authorship, assessment and ethical responsibility. Educators must build their understanding of legal frameworks such as GDPR, intellectual property rights and the upcoming EU AI Act to guide students in responsible AI use. At the same time, institutions must provide clear policies that define acceptable use, ensure data protection and support staff with professional development. Without such frameworks, responsibility falls unevenly on educators, increasing the risk of non-compliant practices. Institutional clarity is essential for aligning innovation with legal and ethical standards.

Finally, sustainable and meaningful integration of generative AI in professional education begins with educators. While frontrunners among

learners will apply generative AI, the potential of scaffolding must be rooted among educators. The educators must be equipped with technical fluency and pedagogical strategies to create learning environments that foster reflective thinking, collaborative inquiry and responsible experimentation with AI. This is especially important in facilitating shifts in attitudes, confidence and behaviour, which is a key finding in our study. As learners began to see AI as a professional sparring partner, their confidence and curiosity grew. Educators can scaffold this development by embracing their role as facilitators of reflection, in line with RPL's view of teaching as a co-constructed and dialogical learning process.

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Short Papers

Applying Reflective Practice-Based Learning (RPL) Principles in Clinical Education

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Abstract

This paper explores how the six fundamental principles of Reflective Practice-Based Learning (RPL) (Horn et al., 2020) can be applied to clinical supervision in health education. Based on an action research project with clinical educators from physiotherapy and occupational therapy programmes, we examine how RPL can strengthen reflective learning processes during clinical placements.

A workshop was designed and facilitated following RPL's fundamental principles, using practice-based cases and structured dialogues to engage clinical educators in reflection on real-life supervisory challenges. The workshop aimed to foster educators' capacity to support students' professional development by creating reflective learning environments that integrate theory and practice.

Drawing on a social constructionist approach to knowledge and narrative analysis, we present empirical findings from a reflective team session and analyse the data through the lens of selected RPL fundamental principles. The narrative highlights how educators navigate the balance between dialogue, collaboration, and appropriate disturbance when guiding students from reflection to action.

Findings indicate that applying RPL principles enhances clinical educators' ability to tailor supervision to students' readiness, particularly when students hesitate to engage in practice. The study contributes to the development of supervision practices that recognise reflection as both a cognitive and practical process, requiring sensitivity, adaptability, and professional judgement.

Keywords

Reflective practice-based learning, RPL fundamental principles, education, clinical education, higher education, practicum

Introduction

The healthcare system in Denmark is continually evolving, making it essential for graduates from health professional bachelor's programs to assess both theoretical and practical challenges (Holm, H. B., 2022). These challenges often have multiple solutions, requiring actions based on situational demands (Horn et al., 2020). The health professional bachelor's programs at UCN must prepare students for future healthcare roles by developing professional competencies. Bundgaard et al. (2023) point out that the transitional shock experienced by students undertaking a practicum can be regarded as both a suitable disturbance and a catalyst for developing reflection potential. This highlights the need for greater awareness of the reflection process from the supervisors.

This research project exemplifies the collaboration between theoretical lecturers and a network of clinical educators to support students' reflective practice-based learning (Horn et al., 2020) in clinical practice. This study responds to a need raised from within the clinical field, where educators seek concrete ways to support student reflection through RPL. The initiative originated from a network of clinical educators from physiotherapy and occupational therapy programs within hospital settings. The clinical educators are responsible for supporting students' learning during their clinical education periods and, therefore, seek methods to improve students' reflection. The students' clinical education periods vary in duration and progress continuously throughout the 3.5-year professional bachelor's program. This teaching responsibility is integral to the clinical educators' professional work portfolio. Both bachelor's programs follow a structure in which students transition between theoretical and practical education. During their clinical education, students encounter various practical situations, whether working with colleagues, fellow students, or independently. The clinical educators' role is to frame an appropriate learning level, ensuring tasks align with the student's learning prerequisites while achieving the learning outcomes set for the clinical education period.

To support students' learning and readiness for their first professional role in the clinical field, both theoretical and clinical educators must create learning conditions and acknowledge the importance of reflection on actions (Holm, 2022). Clinical educators aim to foster reflection in practice, thereby supporting students' ability to link theory and practice during their clinical education periods. Furthermore, the clinical educators also achieve a collective awareness of the concept of reflection. Consequently, we pose the following research question for this study: How can RPL help clinical educators better support students' ability to reflect during clinical education?

Theoretical Framework

Reflection plays a central role in the learning process when supervising students in clinical practice (Horn et al., 2020). It may be the student who must decide which intervention should be prioritised first in the rehabilitation process for a patient with multiple conditions. Within this context, supervisors are not only responsible for ensuring progression toward learning outcomes but also for facilitating reflective spaces that help students integrate theoretical knowledge with clinical experience. Donald Schön's theory of the reflective practitioner provides a conceptual framework for understanding how such reflection can support the development of professional judgment (Schön, 2001). Schön emphasises that knowledge from formal education becomes meaningful when applied in collaboration with experienced practitioners in authentic settings, in which theoretical insight and practical experience become linked (Schön, 2013).

The settings in clinical education are designed to align with the learning tasks that students are expected to master. Schön emphasises that clinical environments are often unpredictable. From a constructivist viewpoint, students face unique and ambiguous situations that challenge their existing knowledge and routines. Here, the clinical educator plays a crucial role in helping students navigate these moments by supporting new ways of thinking and acting. Schön distinguishes between two types of reflection relevant to this process: reflection-in-action and reflection-on-action (Schön, 2013).

Reflection-in-action occurs in the moment of practice, as students adjust their actions based on their immediate interpretation of the situ-

tion. Supporting this form of reflection requires the supervisor to engage students in real-time questioning that enhances their awareness of their reasoning and responses (Schön, 2013).

Reflection-on-action, on the other hand, takes place retrospectively and allows students to explore the reasoning, emotions, and alternatives behind their actions. This often unfolds through follow-up dialogues or structured reflection activities guided by the clinical educator (Schön, 2001). Both forms of reflection are integral to students' development, and both rely on the clinical educator's ability to shape and hold space for critical thinking within practice.

By framing supervision as a reflective practice in itself, Schön's (2001) theory offers a foundation for examining how educators work with reflection, and how this work can be further supported by approaches such as RPL.

Dewey describes experience as the basis for reflection, with experiences being related to both thinking and action. He explains learning as a circular process that moves from pre-reflection to post-reflection, thereby progressing from hesitation and doubt to greater confidence in the situation (Horn, et al., 2020).

The White Paper on Reflective Practice-Based Learning (Horn et al., 2020) outlines six fundamental principles that serve as a framework for fostering better conditions for reflection. In this Short Paper, we will focus on three of these six principles, as they were intuitively chosen by the clinical educators. The selected principles are; no. 2) Teaching and learning activities designed to include appropriate disturbances, no. 5) Lectures and students work together on learning processes, and no. 6) Lectures and students create room for dialogue (Horn, et al., 2020).

Methodological considerations

This project is based on a dialogical methodology, which in itself could merit further exploration. However, this short paper aims to investigate how the fundamental principles of RPL can be applied in clinical education as a foundation for reflection. The project is grounded in a social constructionist understanding of knowledge, in which knowledge is seen as co-created through language and relationships (Gergen, 2010).

Consequently, dialogue, co-creation, and equal collaboration between researchers and clinical educators have been central to the study.

We have chosen action research as our methodological approach, as learning is here understood as a complex phenomenon connected to participation, the formation of social communities, and experimental actions. Action research enables us to explore the relationship between reflection and action, as well as the interplay between theory and practice among participants, including our roles as both facilitators and participants in the research process (Frimann, Jensen & Sunesen, 2020). Despite the equal collaboration, we have been responsible for designing and framing the process.

In total, the group consisted of eight clinical educators, and we met with them twice over the course of one year, supplemented by ongoing dialogue. The meeting investigated in this paper was organised as a reflective team session (Andersen, 1994), where three participants, selected as focus persons, shared their experiences with their actions and received perspectives from the other participants. The session was audio-recorded and subsequently transcribed. This transcription forms the empirical basis for the analysis. Based on the data, a narrative has been constructed and interpreted through the lens of the fundamental principles of RPL. The purpose of the analysis was to demonstrate, apply, and discuss the clinical educators' use of RPL and the six fundamental principles in their clinical teaching with students from both the physiotherapy and occupational therapy education programs. The analysis is structured thematically with the chosen RPL fundamental principles as a framework.

Analysis, findings and discussions

To explore the processes and actions involved in our understanding of the clinical educators' practice, we have, as a natural extension of our social constructionist view, chosen to construct our practice account in the form of a narrative. As Bruner (1999) puts it:

There is a kind of human “readiness” for narrative [...] similar to our readiness to transform our visual world into figure and ground [...] a tendency to organise experience into narrative form, into plots and so forth (Bruner, 1999, s. 54).

Our aim is, through storytelling, to identify deviations and connections between the unusual and the ordinary rather than to search for any final or objective truth about reflection in clinical education. By using the dramatic qualities of narrative, we seek to identify possible points of development and, in doing so, generate knowledge that is both meaningful and applicable for future work with the RPL principles as a framework for reflection in clinical education.

Practice Narrative: When the Will Is There, but the Courage to Act Is Missing

I had a student in the final part of clinical education who wanted to work with patients with respiratory difficulties. He saw it as a valuable learning opportunity but was clearly unsure about how to handle such vulnerable patients.

When we began working with pulmonary physiotherapy, he asked to start as an observer. He followed a colleague with experience, but when she suggested he try a small part of the treatment, he said no. He wasn't ready. I suggested pairing him with another student to see if that might make him feel safer, but he didn't want that either. And I could sense that observation no longer moved him forward.

We built it up over three or four sessions. Gradually, he started taking on more of the treatment. That's when I could begin to step back. I constantly had to sense where he was and how to support him without taking over.

He succeeded. It became a good experience for him. But it was only with that one patient. I was left with a clear insight: it takes a lot when someone can only act once everything feels completely safe. The narrative illustrates a learning process where reflection is given room to unfold, while action proves more difficult. The student is described as someone who wanted to work with patients with respiratory difficulties and saw it as a valuable learning opportunity, yet at the same time, he wasn't ready to act. The educator's task is to balance support for reflection with creating opportunities for the student to take that step from thought to action.

In the light of fundamental RPL principle no. 5, Collaboration, we see a clinical educator who consciously considers the student's stated learning goals while acknowledging and accommodating his uncertainty. The student is motivated, but not yet ready to act. He engages in reflective thinking about what he wants to learn, a form of pre-reflection in Dewey's (1933) terms, but lacks the courage and safety to move from thought to action. This situation can be seen as an example of what Schön (2013) terms reflection-in-action, where the clinical educator continuously senses and responds to the student's readiness in the moment, without necessarily verbalising the reflection.

While the student accepts observation as a starting point, he declines other forms of engagement, such as peer collaboration as ways to support progression, but the student declines. It becomes clear that collaboration is not simply about being part of a social setting, but about actively engaging in practice. The student is willing to reflect and talk about action, but not yet to engage in joint action. In this case, collaboration becomes an exposure that can inhibit progress if the student doesn't feel safe.

From the beginning, the clinical educator uses dialogue not to push progress, but to understand where the student is. When he *asked to start as an observer*, the clinical educator adapts rather than insists. Here, dialogue (fundamental principle no. 6) becomes a support for planning, allowing the clinical educator to gradually tailor the pace and format of the learning environment to the student's needs and readiness.

Collaboration, often seen as a central driver of learning in practice, here becomes a barrier for the student's development. This is clear when the student, despite observation and support from both supervisor and colleague, refuses even small attempts at action in a safe setting. The clinical educator tries different approaches: allowing observation, proposing peer work, and offering minor tasks. But each time, the pace must be adjusted. This requires the clinical educator to sense when shared engagement in practice becomes an unsuitable disturbance, and to hold it back until it makes sense for the student. In these subtle shifts, the clinical educator's professional judgement and the practical value of the fundamental RPL principles become visible.

It is through this careful adjustment that the principle of appropriate disturbance proves useful. It helps the clinical educator support forward movement, without crossing the student's emotional threshold. Progress doesn't emerge from structure alone, but from the clinical educator's

ongoing sensitivity to when and how the next step can be taken, as described in the fundamental RPL principle on appropriate disturbance.

It becomes *a good experience for him*, but *only with that one patient*. The clinical educator is left with a sense that learning has not fully taken root. How many times must an action be repeated before it becomes learning? What is the role of reflection if it isn't followed by action?

This highlights a key aspect of clinical education: it's not only about competence but also about courage and trust. And it requires a finely tuned facilitation by the clinical educator to balance safety, responsibility, and development.

One insight that has emerged from this project is the distinction between dialogue and collaboration. In this narrative, the student is willing to engage in discussions about the task; however, when it comes to actual collaboration and sharing responsibility, the student tends to withdraw. What is typically regarded within RPL as a supportive and structured factor can, in this instance, become overwhelming.

This situation challenges the notion that collaboration is inherently positive. For this student, the opportunity to choose not to collaborate is what ultimately facilitates progress. It becomes clear that action only begins when the clinical educator steps back and assigns small, individual tasks. Therefore, while collaboration is often seen as the driving force behind RPL, it must be moderated in this case for any meaningful progress to occur.

This leads us to consider whether it is the clinical educator's conscious application of the fundamental RPL principles, especially the principle of appropriate disturbance, that truly makes a difference. It also raises the question of whether engaging clinical educators in shared reflection on these principles could better prepare them to support a new generation of students. These students may increasingly prefer safe options, so clinical educators need to help them find the courage to act. This can be achieved not by forcing them, but by understanding how to **balance reflection with responsibility in practice**.

Conclusion

The case illustrates that reflection goes beyond merely thinking about practice; the process also involves navigating through practice, even when confronted with uncertainty. Central to this case is the interplay

between three chosen RPL principles: dialogue, collaboration, and appropriate disturbance.

The dialogue begins with the student expressing a desire to learn, while the educator listens and adjusts the plan accordingly. However, collaboration, defined as shared engagement in practice, must be paused, as the student feels it may be too disruptive. The challenge for the clinical educator is to maintain the reflective process while gently guiding the student through their transition into action. This approach is actively supported by the principles of RPL.

In the narrative, this process occurs through small, graded tasks that provide opportunities for reflection while gradually introducing action at a pace suitable for the student. This is where we witness reflection in motion, not just as conversation, but as tangible progress. Recognising RPL does not offer a one-size-fits-all approach; instead, it equips clinical educators with a language and a set of guiding principles to navigate the challenges that arise when students learn to act and reflect simultaneously. While the narrative presented here is based on a single case and focuses on three selected RPL principles, it offers insight into how these principles may be enacted in real-life supervisory situations. Future research could explore how a broader range of principles is experienced and interpreted by clinical educators across different contexts.

This short paper demonstrates that while RPL does not remove the complexities of clinical learning, it offers a framework for addressing these complexities in a sensitive and student-centred manner. This points to the need for further research into the application of RPL in clinical practice.

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Navigating the Double-Edged Sword of AI Integration in Higher Education: Student perspective

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Abstract

Digitalization is rapidly transforming society and reshaping higher education. Driven by generative AI technologies (GenAI), this shift challenges traditional paradigms and requires exploration of how digital literacy supports *Reflective Practice-based Learning* (RPL). Drawing on a sociomaterial theoretical understanding, this case study explores challenges and solutions in the dynamic interplay between social and material elements as AI is woven into the students' study practices. The aim is to generate insights into students' perspectives on the use of GenAI in their study practices. International master's students in Swedish higher education participated in focus group interviews, reflecting on AI's role in their education. Using a problem-tree methodology, students discussed the focal problems, the underlying causes, and possible solutions. Findings show that while students value GenAI for efficiency and judgement-free support, its ubiquity creates a perceived obligation to adopt it, which fuelling ethical, emotional, and academic tensions. Students fear diminished critical thinking and creativity through over-reliance, describing AI as both enabler and threat. They call for compulsory AI-use labeling by tool providers, explicit institutional guidelines, and more hands-on, creative assignments that foster independent reasoning and AI literacy. Without such measures, comfort, social pressure, and "speed culture" risk undermining RPL's reflective depth. The study underscores the need for balanced, transparent integration of GenAI to harness its benefits without compromising core academic skills

Keywords

Higher education, master students, problem tree analysis, sociomateriality, AI literacy, study practices

Introduction

The expansion of technological solution in education is disrupting academic practices, driving the need to explore how emerging technologies are shaping higher education (HE) to navigate and adapt value strategies, and manage structural and organizational challenges (Vial, 2019). The integration of generative AI (GenAI) in academic programs and courses has initially caused a prevalent focus on the risks of plagiarism mobilizing HE to raise awareness and develop policies and guidelines for the use (Schiff, 2022; Jóhannesdóttir et al., 2025). Many national AI policies focus on digital skills recognizing that AI is transforming industries, and without proper training, there may be skill gaps that hinder innovation and economic growth (Saheb & Saheb, 2023). Thus, recent advances in GenAI are reshaping established educational paradigms, thereby necessitating an exploration of the ways in which digital literacy underpins Reflective Practice-based Learning (RPL; Jensen et al., 2023), a pedagogical approach that combines authentic, practice-centred activities with systematic reflection.

Grounded in sociomaterial theory, the present study explores the co-constitution of social and material dimensions as GenAI tools become embedded in students' everyday learning routines. The research aims to explore international Masters students' perspectives on GenAI, focusing on the challenges it introduces, the solutions they formulate and the implications for their study practices. More specifically, the students will engage in structured, collaborative reflections designed to map AI's challenges and solutions.

Previous research

Recent research highlights that GenAI affects students' study practices in HE by increased access to knowledge, providing personalized feedback and clarification enhancing readability of academic literature (Wang, 2024) and acts as conversational partner simulating social interactions (Bozkurt et al., 2023). These AI-driven systems generate text and images,

provide immediate guidance, enabling students to make direct adjustment to improving grammar (Mahapatra, 2024), strengthening their self-confidence and self-efficacy (Nazari et al., 2021). GenAI has therefore become increasingly appealing to students, particularly for academic writing, by supporting source summarization, translation, automated text evaluation, personalized feedback, and collaborative writing, potentially fostering critical engagement with literature and content (Rasul et al., 2024). Providing more readable explanations in easy-to-understand language can enhance comprehensibility (Huang et al., 2024) and support students in idea generation with the use of multiple languages could be a way to reduce cognitive load (Nazari et al., 2021). AI-generated text can be a useful tool when students devote time and cognitive effort to critically engage with the content (negotiated reading) or critique AI-generated text (oppositional reading) rather than simply accepting it (Anson, 2024). The cognitive offloads of GenAI are, however, considered disrupting learning in relation to understanding and evaluating of academic texts (Anson, 2024). The key identified risks of GenAI in HE involve academic integrity and plagiarism, but also ethical issues and ine-quality in education (Cerratto et al., 2024). The biases in text and pictures produced by GenAI further challenge students' academic writing practices (Daniel et al., 2023). Students are facing a higher risk of being suspected of AI-related plagiarism if their AI-assisted texts appear as overly linguistically flawless (Warschauer et al., 2023).

Developing AI literacy requires both technical, cognitive, critical and ethical skills, to find, understand, evaluate, and communicate AI-generated information (Ng et al., 2021). Prompting is highlighted as a central skill requiring crafting, refining, and iteratively optimizing precise prompts to generate desired outputs (Kim et al., 2025) and effectively translate between different modes (e.g., from text to image, or text to sound; Cope & Kalantzis, 2024). AI-generated texts show a high degree of spelling and grammar accuracy (Bruno et al., 2023), whereas attributing human-like qualities and assuming the output to be well-thought-out, intentional, or even ethical can lead students to overrely on AI-generated content without critically evaluating its biases, or limitations. The level of trust in AI-generated text influences students' attitudes and intentions of use of AI (Albayati, 2024).

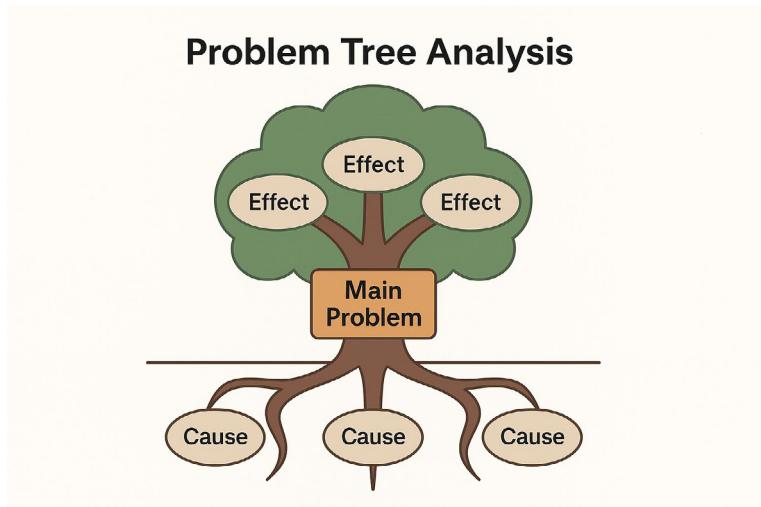
Data collection and analysis

We used participatory methods for data generation in this study employing the problem tree analysis, which is a systematic analytical tool, enabling students to articulate causes and consequences and to engage in collaborative discussions on solutions (Vaugh & Jacquez, 2020). Problem tree analysis decomposes complex issues into smaller, more manageable components and is widely applied in fields like project management, product design, and education (McMain, 2023). Visualised as a tree (see Figure 1), the trunk represents the focal problem, its roots denote underlying causes, and the branches depict resultant effects, thereby providing a structured map for clarifying AI-related challenges and solutions.

Problem Tree Analysis Workshop

In this study, we gathered students ($n=10$) in an international, on campus master program on IT and learning to share their experiences with GenAI in student work with their peers in a workshop applying problem tree analysis. The students came from diverse professional backgrounds and nationalities, the majority were females. The participants were informed about the aim of the study and how the data production and analysis will be conducted, before signing a consent to participate (Swedish Research Council, 2024). We divided the students into two groups ($n=5$ per group) and asked them to collaboratively develop a single "problem statement" using an illustration of a tree that represents the main problem (trunk), list all the causes (roots) and consequences (branches), and reflect on a solution to the problem. The students engaged approx. 1,5 hours in group brain-storming, discussion, and categorization of *Why* does the problem exist? (causes) and *What* consequences or effects does the problem have, writing down and placing post-it notes in the problem tree. They were asked then to dig deeper with each root and branch, ask "why" or "so what" so many times to have a deep understanding of the challenges. Finally, they discussed possible solutions: *How* could you tackle the roots to solve the problem? The generated data consists of the problem trees printed on paper with post-it notes in different colours and audio recordings of the groups' discussions.

Figure 1: The problem tree



Theoretical framing and analysis

The sociomaterial perspective (Orlikowski, 2007) adopted in this study entails an exploration of the ways in which technology becomes a ‘technology-in-practice’ when it is integrated in students’ everyday study practices. As Orlikowski (2007, p. 1437) argues, materiality is “integral to organising,” with the social and the material constitutively entangled in daily life. Hence, we approach students’ learning practices as shaped by the inter-twined discursive and material dimensions of digital platforms and AI tools. By centring on this entanglement, we seek to illuminate the challenges and solutions of AI from the students’ perspectives.

Findings

In this section we show the excerpts from the final representation of the respective groups’ problem tree (see Table 1) and then we present the identified challenges (causes and consequences) and solutions highlighting their reflections about the uses, practices and views of students.

Table 1: Students' Problem Trees – Group 1 & Group 2

Problem: Students in higher education too reliant on AI		Problem: Pressure to use AI or be left behind	
Causes: <ul style="list-style-type: none"> • High academic pressure • Ease and accessibility of GenAI • Normalization of AI use • Emotional safety with AI • Efficiency and time management • Procrastination and dependency 	Consequences: <ul style="list-style-type: none"> • Loss of critical skills • Overreliance on biased AI information • Ethical concerns • Identity and ownership issues • Privacy and awareness gaps • Homogenized thinking and fatigue 	Causes: <ul style="list-style-type: none"> • Unaware of embedded AI • High expectations on use • Lack of time • Information overload • AI competence for success • Need to understand • Competition • Media and pop-culture 	Consequences: <ul style="list-style-type: none"> • Overreliance on AI • Shallow understanding • Standardized knowledge • Critical thinking suffers • Digital divide in the use • Increased minimum expectations in productivity
Solutions: <ul style="list-style-type: none"> • Enhance education with creativity, critical thinking, and hands-on activities • Implement clear policies and targeted AI education • Develop foundational skills early 		Solutions: <ul style="list-style-type: none"> • Mandatory signifiers of AI in systems • AI and digital literacy: ethical training, decision making 	

Students in higher education too reliant on AI

In the first student-led discussion on the use of GenAI in academic work, one participant took the lead in unpacking what the group identified as a growing problem: students in higher education becoming overly reliant on AI tools like ChatGPT. The conversation revealed a wide range of perspectives and experiences, shaped by academic pressure, digital habits, and evolving student-teacher dynamics.

From the outset, there were differing views. One student raised concerns about unequal access to GenAI tools, only for the group leader to dismiss the issue, noting that many tools are now freely available. Another student used ChatGPT during the session to translate instructions

for the task, underscoring both accessibility and dependency. The group explored why students are turning to GenAI. Common causes included procrastination, the convenience of AI, and the lack of feedback or support in traditional academic settings. A recurring theme was how AI feels emotionally safe—unlike teachers, it does not judge or evaluate, making it easier to engage with. Some students described GenAI as a “neutral partner,” and compared it to teachers who are often perceived as more critical. Interestingly, while they assumed teachers use GenAI too, they had rarely seen concrete examples, except for some who used it to generate images.

As more causes were shared, students began to connect the dots—recognizing that procrastination, for example, could be both a cause and a consequence of GenAI use. They moved fluidly between identifying causes, discussing consequences, and even suggesting solutions, showing that these categories often overlap. Concerns about academic integrity surfaced throughout. The students mentioned plagiarism, a blurred sense of authorship, and a general fear that reliance on AI leads to laziness. Yet, they often referred to others—not themselves—as those who were becoming too dependent. Still, the group leader highlighted how one participant was actively using GenAI to complete tasks, illustrating the reality of the issue.

The conversation also touched on “AI fatigue”—a sense of boredom or mental exhaustion from constantly engaging with AI-generated content, which students described as flat or uncreative. At the same time, the human-like interface of GenAI tools seemed to foster an emotional connection, further deepening dependency. Disagreements emerged, especially around the use of AI detection tools and whether tools like Google Translate were comparable to ChatGPT. These moments of debate highlighted the lack of clarity students often face when navigating AI in academic contexts.

Toward the end, the group discussed potential solutions, such as integrating AI literacy into education, clearer institutional guidelines, and more creative, hands-on assignments. Some even suggested early digital education outside university settings. One student pointed out how improved prompting skills can blur the line between AI-generated content and original work—raising questions about what can truly be called one’s own. Overall, the discussion revealed that while GenAI is viewed as

useful, it also poses risks to learning, integrity, and creativity—especially when it becomes a default tool rather than a thoughtfully used resource.

Pressure to use AI or be left behind

Students in the second group reflected upon the problem from the perspective of being expected to use AI technology, feeling compelled to use AI tools avoiding a disadvantage compared to peers. Students recognized that AI is increasingly embedded in everyday digital tools, creating an illusion of choice and reducing creativity by adding cognitive load and trapping them between convenience and autonomy. They linked the pressure to use AI to the fast-paced, competitive nature of education and the job market, where speed often outweighs critical thinking. AI was seen as a necessary tool to manage information overload and tedious tasks, especially under time pressure, justifying its use without guilt. Another cause they identify relates to AI as a competence for success and their experiences of other students “bragging” about not doing things manually, such as: *“I didn’t read all that”* or *“I just used AI”*. Thus, creating a norm and a kind of “default competence” in the offloading with AI regarding it as effective and smart. They found policies about AI vague or decentralized, often left to individual departments or instructors.

When it comes to effects and consequences, the students share a pragmatic, open-minded attitude toward using new technologies like AI, saying essentially: *“If there’s a useful tool, why not use it?”* At the same time, they raised concerns about overreliance, fearing it could narrow understanding and limit diversity in thinking. They discussed how algorithmic recommendations create repetitive experiences, the so-called “algorithm trap,” which can restrict discovery, critical thinking, and creativity. They reflected on the consequences from the perspective of a new kind of digital divide occurring now in the confident use of AI rather than just access, experiencing also enhanced expectations of productivity from employers (a quantity aspect rather than quality).

Solving the problem, the students are proposing mandatory AI-use labels and enhanced AI literacy. They acknowledge, though, that true global regulation and ethical use may be impossible due to differing international standards, ultimately stressing the importance of education, awareness, and preparing ourselves to use AI wisely, since it is here to stay.

Discussion of preliminary findings

This small-scale case study limited to single-institution setting, reveals that students engaged with GenAI in their discussions while also embedding broader aspects of AI and digital technologies. They recognized that although AI can enhance efficiency and academic outcomes, widespread access is normalizing its use, leading to shifting expectations and standards. Students acknowledged that GenAI offers convenience and non-judgmental assistance but also expressed concerns that this could foster dependency. Their reflections suggest that the core challenge lies not in access to or use of AI itself, but in *the illusion of choice* surrounding its adoption. Students reported feeling pressured to use AI tools to keep up, generating ethical, emotional, and academic tensions. Both groups expressed concerns about a potential decline in critical thinking and creativity due to overreliance on AI. They criticized the current vague and hesitant regulation of AI, advocating for mandatory AI-use labelling by tool producers, clearer institutional guidelines, and more creative, hands-on assignments designed to cultivate independent thinking and enhance AI literacy. Thus, the use of AI in HE emerges as a double-edged sword: while it can enrich learning, it also risks encouraging superficial, dependent-driven academic practices.

Across the cases, students underscored the *complexity* of integrating AI into student work in HE. They demonstrated *strong reflective capacity*, critically examining issues of variations in access, academic integrity, and dependency. Ultimately, they called for improvements in AI literacy, more explicit guidance, and educational approaches that prioritizes creativity and independent engagement.

The findings also suggest that emotional comfort, social pressure, and a prevailing “speed culture” may hinder students’ deeper engagement with reflective, practice-based learning (RPL) unless these tensions are actively addressed. Students’ descriptions of feeling emotionally “safe” with AI as a neutral partner illustrate a material-discursive entanglement, where AI is used more for emotional reassurance than purely for efficiency; illustrating how students prefer AI over teachers as partners in their student work.

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Effectiveness of Immersive VR for Reflective Learning in Architectural Technology and Construction Management Education

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Abstract

This study investigates the practice of reflective learning in construction management education by exploring the integration of immersive virtual reality (VR) technologies. Traditional educational approaches often struggle to provide students with immersive and practical experiences that replicate real-world construction scenarios. VR offers an innovative solution by enabling experiential learning in a risk-free environment, supporting the development of critical skills such as decision-making, safety management, and project execution. The research employs a Design-Based Research methodology to design and evaluate interventions that integrate VR into educational frameworks. These interventions are guided by the Reflective Practice-Based Learning (RPL) principle: "Teaching and learning activities are organized as exploration." The study uses qualitative analysis to examine how VR can enhance students' reflection, deepen understanding, and support knowledge transfer and skill development in building design. The findings provide insights into how VR can facilitate meaningful engagement with complex building designs and contribute to the near and far transfer in learning. The immersive VR in education demonstrates significant potential for transforming traditional educational methods. The study's practical implications lie in providing new educational designs that combine technological tools with reflective, practice-oriented learning approaches.

Keywords

Reflective Practice-Based Learning, Immersive Virtual Reality, Architectural Technology and Construction Management Education

Introduction

The use of immersive technologies, particularly Virtual Reality (VR), is now well established in higher education. VR and 3D environments enhance engagement, experiential learning, and knowledge retention, making them powerful tools for both theory and practice. Reviews (Radianti et al., 2020; Wang, 2018) show benefits in spatial learning, motivation, and cognition, while studies in construction education (Le et al., 2015; Lucas et al., 2018) demonstrate VR's effectiveness in supporting experiential learning and efficiency.

By simulating real-world complexity, VR supports both theoretical understanding and professional practice. This aligns closely with the principle of explorative learning (Concept 3 – “Teaching and learning activities are organized as exploration.”)(Horn et al., 2020; Brinkmann, 2016; Miettinen, 2000). Here, learning is not about reaching a fixed point. Through reflection, questioning, data collection, and hypothesis building, students are encouraged to interpret situations they experience (Horn et al., 2020) from multiple perspectives. This process, often referred to as abductive learning, supports critical thinking and adaptive problem-solving. Explorative learning is characterized by engaging students in processes of questioning, hypothesis formation, and abductive reasoning, particularly in situations where meaning is uncertain or fragmented. Rather than delivering fixed outcomes, such teaching strategies invite learners to investigate problems from multiple perspectives, collect and interpret data, and develop informed responses through reflective practice. The teacher's role is to design these learning environments in ways that stimulate curiosity, support experimentation, and qualify the reflective dialogue (Laursen, 2017).

Although immersive VR has been widely studied in industrial contexts, there remains a lack of research examining its impact on learning processes and outcomes within higher education settings. Therefore, this study investigates how the use of immersive VR in architectural technology and construction management education (ATCM) can support effective student learning through exploration, reflection, and applied

practice. Guided by the RPL principles and Wahlgren's theory of transfer (Wahlgren & Aarkrog, 2012), the study examines how immersive learning environments support knowledge transfer. Near transfer occurs when students apply knowledge in familiar contexts, while far transfer requires adapting learning to novel or unpredictable situations. By involving students in reflective, experience-rich learning tasks, we aim to understand how VR can enhance the ability to connect theory with practice and promote learning that is not only engaging but also meaningful and transferable to real-world construction work.

Research question is posed as follows: *How can the use of immersive VR technologies in ATCM education support effective student learning by promoting near and far transfer through exploration, reflection, and practice, understood within the frameworks of Reflective Practice Learning and Wahlgren's transfer theory?*

Background

This study is grounded in Bjarne Wahlgren's theory of transfer (2013), which emphasizes the conditions under which knowledge and competencies acquired in education are applied in real-world contexts. Wahlgren identifies multiple dimensions of transfer, particularly near transfer (application in familiar contexts) and far transfer (adaptation to novel situations), as critical outcomes of effective learning. His framework outlines twelve key factors influencing transfer, ranging from learner motivation and confidence to instructional design and workplace support.

These dimensions are particularly relevant when immersive technologies like VR are used to support education. VR environments allow for both direct rehearsal of workplace tasks (supporting near transfer) and conceptual exploration that generalizes across contexts (supporting far transfer). This dual potential aligns with Reflective Practice-Based Learning (RPL) (Horn et al., 2020), which frames learning as a process of inquiry, hypothesis-building, and reflection in and on action. The use of VR in construction is grounded in theories of cognitive load reduction, collaboration, and experiential learning. VR's immersive 1:1 environments enhance spatial understanding and reduce abstraction compared to traditional 2D/3D reviews (Haahr, 2023). It fosters interdisciplinary collaboration by providing a shared virtual space, supporting real-time interaction and decision-making aligned with Social BIM principles

(Zaker and Coloma, 2018). Additionally, VR promotes reflective practice through simulation and exploration, supporting knowledge transfer within frameworks like RPL (Zaker and Coloma, 2018). When integrated with BIM, VR further enhances design comprehension, clash detection, and stakeholder engagement (Alizadehsalehi et al 2020) despite challenges like cost and adoption resistance.

Research settings

This study is situated within “De Digitale Dage 2025”, a national, cross-institutional educational initiative that bridges professional construction practice and vocational education through digital and collaborative experimentation. The project engages students from multiple institutions – including UCN, AAU, EUC Nord, and Tech College – who work in interdisciplinary teams to develop a building design proposal for the renovation and refurbishment of a public school into a training centre for the North Jutland Police.

Participants assume professional roles such as project manager, BIM coordinator, and sustainability advisor, collaborating across disciplines using industry-standard tools like BIM 360, Revit, Dalux, and LCA Byg. The project’s 12-week format and emphasis on teamwork, role-based responsibility, and final presentation offer a highly authentic educational setting. Within this framework, a VR-based learning intervention was introduced to investigate how immersive VR technologies can support exploratory learning, reflective practice, and knowledge transfer.

Methodology: Design-Based Research (DBR) Approach

To explore and develop educational practices grounded in real-life contexts, this study employs a Design-Based Research (DBR) methodology. DBR is well-suited for the dual aim of generating both practical interventions and theoretical insights within complex educational settings. Rooted in pragmatism (Maxcy, 2003), DBR embraces flexible, iterative, and context-sensitive inquiry, closely aligned with both RPL and Wahlgren’s transfer theory (2013).

As described by Ann Brown (1992) and Anderson and Shattuck (2012), DBR supports the creation of educational innovations that respond to actual learner needs, while simultaneously contributing to broader the-

oretical development. The project was structured around four iterative DBR phases, tailored to the educational context and timeline of “De Digitale Dage”.

Phase 1: Contextual and Theoretical Foundation. This phase focused on building a foundation for the intervention, including reviewing relevant literature in Design-Based Research, transfer of learning (Wahlgren, 2013), and RPL, mapping the technological and pedagogical environment of “De Digitale Dage”, and identifying key competencies and tasks where a VR intervention could meaningfully enhance learning and reflection.

Phase 2: Design of the VR Learning Intervention. Based on the initial analysis, a VR-based module was developed. The design was built to do three things: first, to give students practice with realistic construction tasks and decisions; second, to encourage creative thinking, open exploration, and thoughtful discussion; and third, to help students use their learning in the given case and in future construction practice. The design also followed Mingfong et al.’s (2010) four effectiveness criteria: a structured framework, effective use of VR features, accurate domain knowledge, and attention to the learning context’s needs.

A VR laboratory was established and equipped with four Meta Quest 2 headsets and one Meta Quest 3 headset, providing students access to high-quality standalone VR head-mounted displays (HMDs). The laboratory utilized Autodesk XR Workshop, a commercial software solution that facilitates the seamless transfer of building designs from Revit into a virtual environment. Autodesk XR Workshop is a multi-user VR platform specifically designed to support collaboration within the architecture, engineering, and construction (AEC) sectors. The platform enables users to explore building designs at a 1:1 scale within an immersive virtual environment, fostering collaboration, discussion, and reflection on spatial configurations and design decisions in real-time.

Phase 3: Implementation in “De Digitale Dage”. The intervention was implemented with three student teams (A, B, C). The VR module was integrated into their collaborative work process as they progressed through design, coordination, and construction planning tasks (Table 1). Each session began with a brief onboarding that covered how to put on the VR headset and launch the software. Once students were in-headset and the application was running, the instructor (one of the authors) provided real-time support and ongoing guidance while students explored. Halfway

through each session, the instructor paused the activity to ask students to reflect on their VR experience and how it could be used in other situations in their studies and in their future jobs in building construction.

Data collection was qualitative and conducted through participatory observation, guided by a structured observation protocol and focus group interviews, which captured students' reflections on their use of VR. This approach was explicitly designed to align with the RPL framework and Wahlgren's transfer theory, particularly focusing on how students engage in meaning-making, collaborative problem-solving, and practical application of knowledge.

Table 1: Data collection

Category	Session (Group A)	Session (Group B)	Session (Group C)
Duration of Session	~45 minutes	~10 minutes	~45 minutes
Students and Backgrounds	6 ATCM (4 th semester), EQF 6 1 Energy Design, EQF 7 1 Construction Management, EQF 7	2 ATCM (4 th semester), EQF 6 1 Electrician, EQF 3/4	2 ATCM (4 th semester), EQF 6
Theme of Session	Exploring possibilities with VR Review of initial proposal	Recording VR experience for presentation Design review of team's model	Exploring possibilities with VR Design review of team's model
Data Collected	<ul style="list-style-type: none"> • Observation: 30–35 min • Interview: 13 min 19 sec • VR video (student): 7 min 58 sec • VR video (teacher): 7 min 30 sec 	<ul style="list-style-type: none"> • Observation: 10 min • VR video (student): 5 min 34 sec • VR video (teacher): 5 min 20 sec 	<ul style="list-style-type: none"> • Observation: 25–30 min • Interview: 29 min 31 sec • VR video (student): 15 min 33 sec • VR video (teacher): 7 min 30 sec

Phase 4: Analysis and Reflection. In the final phase, collected data were analyzed through thematic coding (Saunders et al., 2023) and interpretive analysis, focusing on: Evidence of near and far transfer; Manifestations of exploratory learning and abductive reasoning; Students' capacity to reflect on their learning process and relate it to professional practice. Findings were interpreted considering the underlying theoretical frameworks and used to refine the intervention. This phase also supported broader conclusions about the effectiveness of immersive learning environments in educational contexts.

Limitations

The study has several limitations. First, it rests on a single, short-term educational event, which makes it difficult to assess far transfer. The sample comprises only thirteen students, and the VR sessions occurred in a controlled laboratory setting, limiting generalizability to typical classroom or workplace conditions. Finally, the instructor's dual role as author and facilitator could be a source of bias (Saunders et al., 2023).

Results and findings

In this section, we present the results of the analysis of the executed educational program. The data were collected in 3 sessions, and the main results are presented in Table 2. As shown, students mostly demonstrated near transfer. They applied VR insights to familiar tasks, for example by identifying construction errors: “*that's the house, and it's not built correctly.*” Far transfer was rarer. It appeared in Group C, where students experimented with model changes: “*what if we make the wall thicker? When the wall becomes thicker, you suddenly get another solution.*” This observation shows the evidence of how skills could be used in future contexts.

Table 2: Results and findings

Theme	Session (Group A)	Session (Group B)	Session (Group C)
Duration of Session	~45 minutes	~10 minutes	~45 minutes
General Understanding	Some students lacked clarity about planning and purpose. Unclear on how VR connected to their learning tasks.	Similar confusion about planning; did not fully grasp what was expected during the VR activity.	Same issues as S2. Students questioned the purpose and relevance of VR activities.
Digital Skills & Tool Use	Unfamiliarity with VR tools caused hesitation. Some students had not previously used a VR headset.	Reported lack of familiarity with VR and digital coordination tools.	Some students lacked access or had trouble navigating technical requirements.
Exploratory Learning (RPL Pr. 3)	Explored possibilities for how to use VR but felt lost without clearer learning goals.	Mentioned wanting more direction for how to engage in learning via VR.	Engaged in the activity but lacked a sense of direction or educational value.
Transfer of Knowledge	Some evidence of near transfer in applying VR learning to digital models.	Minimal signs of applying learning beyond the session.	Students applied technical skills directly to the case and discussed how they could use their competencies in future contexts.
Collaboration	Collaboration was mixed; some relied on peers, others struggled due to unclear group roles.	Group dynamics less effective; students found teamwork fragmented.	Same as S2, but some noted attempts to help each other understand the task.

Discussion

Students entered the VR sessions with diverse educational and professional backgrounds, influencing how they interpreted tasks and engaged with the technology. This diversity, while beneficial for interdisciplinary

learning, also created confusion when instructions or objectives were unclear. A lack of shared understanding often reduces focus and engagement. As one participant expressed: “Some students come directly from high school and don’t know what we’re referring to when we discuss certain things. In those cases, VR allows us to point and say: *that’s the house, and it’s not built correctly.*”

Many students had limited prior experience with BIM and VR tools. This gap created initial barriers in navigation and understanding the digital workflow. These findings emphasize the importance of early onboarding and digital preparation to enable effective learning transfer, as discussed by Wahlgren (2013).

Some students demonstrated exploratory learning through trial-and-error and model revision. As one participant noted, “...I’ve been playing around with it these last two days and gained a lot of experience just by testing the program – what can it do, what can’t it do...” However, the lack of structured guidance hindered their ability to connect such experimentation to broader learning goals. Support for abductive reasoning and reflective framing is therefore essential to maximize VR’s potential as a tool for meaningful exploration

As shown in findings, evidence of near transfer was present when students applied insights gained in VR to immediate design tasks. Far transfer has been observed in session C, and was limited in session B. These results can point to that structured reflection and instructor support are crucial to enable deep, transferable learning outcomes, consistent with Wahlgren’s model.

Collaboration outcomes varied. Effective peer learning occurred in groups with clear task distribution and communication. In less structured groups, unclear roles and weak interaction limited knowledge exchange. Clear team roles and guided collaboration strategies are recommended to enhance social learning. Students across sessions expressed a clear need for stronger instructional support.

Importantly, the findings suggest that instructor presence within the VR environment is also crucial. In session B, for example, extensive guidance was needed to help students navigate tasks effectively. This indicates that active instructor involvement during VR experiences is essential to maintain focus on learning goals and support both near and far knowledge transfer.

Conclusion

These findings highlight the importance of designing immersive learning activities with structured goals, clear facilitation, and preparatory digital training. VR can effectively bridge theory and practice in construction education, but its success depends on didactic integration, reflective support, and inclusive collaboration.

Further studies should investigate the long-term impact of VR learning on real-world application, the role of structured reflection tools in enhancing transfer, and how immersive technologies shape professional identity in construction education. Additionally, more research is needed on the role of instructor training and equity in access to digital tools.

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Experimental AI Lab in Journalism and Communication

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Abstract

In this project we are investigating how generative artificial intelligence (GAI) can be didactically integrated into teaching with the goal to strengthen students' AI literacy. The focal point is creating an AI lab in the form of a scenario-based game, where journalism and communication students use AI tools collaboratively to produce content in a realistic scenario.

Students must produce content using GAI programmes in the scenario. After the game they must reflect on the AI tools' relevance and ethical implications in the scenario and the profession as such. The students' experiences and critical reflections are essential in the project.

We also examine how we as educators can design the AI lab using GAI tools. In the making of the scenario and the tasks in the game, we have used ChatGPT and Midjourney to develop specific roles and situations of conflict during the game. The Gamemaster has also used ChatGPT during the games to develop the tasks for the groups. This makes the development of the scenario flexible and enables turning the story and the tasks in different directions.

The project is grounded in Reflective Practice-based Learning (RPL) and follows a Design-Based Research (DBR) approach.

Keywords

Reflective practice-based learning, Generative AI, AI Literacy, Scenario-based learning, Design-based research

Background

Generative Artificial Intelligence (GAI) is reshaping the professional landscape that the Danish School of Media and Journalism (DMJX) prepares students to enter. The growing influence of Large Language Models and other AI technologies is evident across every stage of the media value chain (cf. Newman et al., 2024; Zerfass et al., 2024; Caswell et al., 2024). As an institution responsible for educating future media professionals, we must actively respond to these major shifts.

This entails developing processes that equip students with a solid understanding of GAI, hands-on experience, and the ability to critically assess its implications and ethical dimensions within journalism and communication. This is what we regard as AI literacy (Ng et al., 2021).

GAI's huge influence on the education sector also opens a fundamental discussion of *whether, how and to what extent* GAI can and should be included in learning processes. A central question is how we as educators can navigate in these changes by enhancing the student's professional competences and promoting their critical reflection skills (Mioa et al., 2024). The speed with which GAI has entered the sector of education has created a research gap concerning learning processes involving GAI, and grounded in pedagogy and didactics (Bruun et al. 2024).

This project focuses also on the *opportunities* AI presents for educators. These opportunities must be systematically explored to build the critical foundation necessary for evaluating where and how AI can meaningfully enhance teaching and learning.

Our focus is on students' gaining AI literacy, but also on the possibilities for educators using GAI in designing the didactic framework for this.

This leads to our two-part research question in this project:

- How can GAI tools be used to design a practice-oriented AI laboratory?
- To what extent can an experimental, structured lab setup foster students' critical reflection on the professional application of GAI programmes and foster AI literacy?

The didactic design process using AI for the practice-oriented and interdisciplinary AI laboratory is making the framework for the students'

critical use and reflections on their use of AI programmes. In this way, we generate knowledge both on GAI in designing learning processes and on using GAI in a simulated practice.

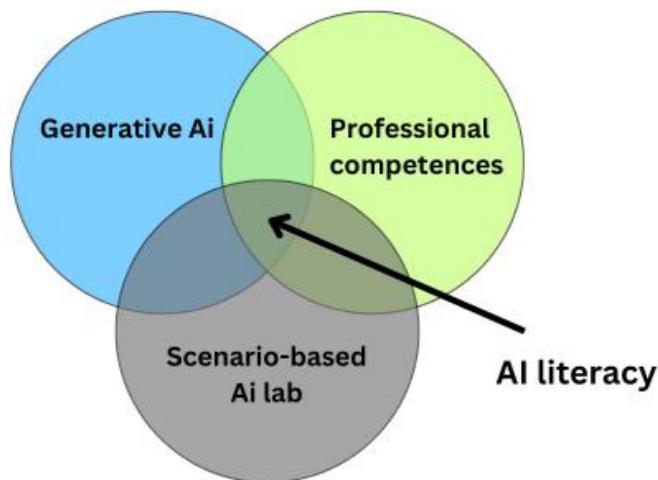
Learning Approach

Our understanding of learning in this project is based on Reflective practice-based learning (RPL) where experience, thinking, and action are key elements in the learning process (Horn et al.). By using game-based approaches (such as simulation, scenario-based learning, and role-play), we aim to create realistic *experiences* that students must act upon using GAI, drawing on both their subject-specific knowledge and their understanding of GAI. Hereby we draw upon experiential learning (Kolb, 1984) where the scenario-based approach allows us to conduct “appropriate disturbances” (Horn et al.) that the students must act upon. They are working in groups throughout the session (approx. three hours) and are encouraged to work collaboratively, both in relation to the tasks and to their critical reflection which are conducted during the game.

We also use GAI as a technology for developing and implementing the game itself, applying a constructionist approach (Wegerif, 2024), where students are encouraged to invite GAI in as a cognitive sparring partner in all decision-making processes throughout the game (Mollick, 2024).

As shown in figure1 below: our goal is to foster AI literacy skills (Ng et al., 2021) for students through our didactic design by combining the use of GAI tools with professional competencies in journalism and communication, and in a realistic set-up in form of the scenario.

Figure 1: AI Literacy: Author's own creation (2025)



Our hypothesis is that AI literacy is possible to foster with our didactic design based on the four aspects (Ng et al. 2021):

- *Know and understand* – basic knowledge about AI concepts and history
- *Use and apply* – practical skills in using AI tools and technologies
- *Evaluate and understand* – critical assessment of AI systems and outcomes
- *AI ethics* – understanding of ethical implications of AI

The four aspects can be seen as four taxonomic levels in addressing GAI in education (Ng et al., 2021) Our didactic design should not be seen as a stand-alone activity fulfilling all the four levels but rather as an experimental learning activity that makes it possible to address the four levels (Kolb, 1984).

Methodological Approach

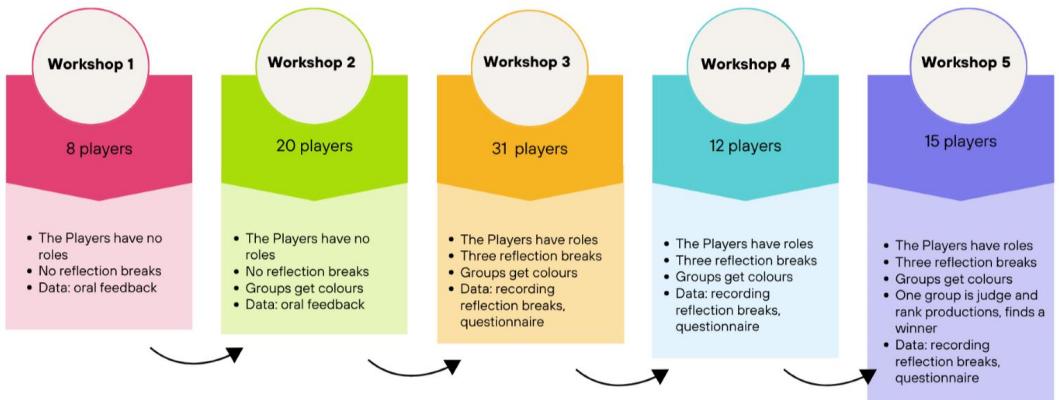
The research approach is based on a Design-Based Research (DBR) methodology, which intentionally integrates research and development to both generate theoretical insights and enhance educational practice. Consistent with DBR-principles, the approach in the project is collaborative, iterative, and closely tied to real-world practice (Gynther et al., 2012)

We seek to generate new knowledge about the use of GAI in communication and journalism education using an iterative approach and at the same time develop, test and improve a didactic design in the form of our AI lab. We work with the dual purpose of both understanding how GAI affects education and teaching and developing a didactic design that promotes AI literacy. This dual purpose is a distinctive feature of DBR. (Gynther et al., 2012). Our research question is therefore addressed through:

- A didactic game-based design that explores the potential for evolving students' professional AI-competence and literacy
- A process where we are developing, testing and improving the game design

In developing the didactic design, we have decided from the start to work with learning games, and thus not with a completely open starting point. A group of students participated in a workshop at the beginning of the project to develop the game design. Educators have participated in testing the game and contributed to improvements to the design in several iterations as shown in figure 2.

Figure 2: DBR approach in the project: Author's own creation (2025)



Data Collection Method

Our methodological approach is pragmatic, combining qualitative and quantitative methods to gain knowledge on the participants' reflections during the workshop and after. The qualitative data was collected by three different methods:

Oral Evaluations: After Workshop 2 and Workshop 3, we conducted oral evaluations with participants. These were recorded on mobile phones, analysed, and summarized in note form.

Audio Recordings of Reflection Sessions: During the three subsequent workshops, we included reflection breaks where we recorded participants' discussions. The recordings were later transcribed.

Own Observations: Throughout all workshops, we took notes on participants' actions, behaviour, and interactions during the sessions and after each workshop.

The quantitative method for data collection was an online questionnaire to the participants in three of the workshops. A total of 45 participants responded to the 10 questions.

Data Analysis

The quantitative data has been analysed according to the questions asked and number of responses.

The qualitative data with the participants' reflections have been analysed in an open, inductive way (Kvale, 1996). The audio files were transcribed and the thematic analysis conducted by categorization and meaning condensation. This process involved identifying recurrent patterns and significant narratives, while remaining attentive to the context, ambiguity, and the subjective experiences of the participants (Kvale, 1996).

This mixed method has been useful as we get data from participants being in the workshop process, but also after the game is over (questionnaire). By combining the results of the data, we can validate the findings through triangulation, and thereby we get multiple perspectives on the topics.

Preliminary Observations

RQ1: How can GAI tools be used to design a practice-oriented AI laboratory?

A significant result of the data analysis is that all participants buy into the scenario and the story development, which have been created with AI programmes, mainly Chat Gpt 4.0. In a survey answered right after the game, around 90% of the participants answer that the setting to a great or some extent contribute to understanding the implications of GAI in a professional context.

The AI lab is set up as an interactive process with participants producing e.g. a press release or an article, for other groups to respond to. Therefore, the pace has always become an issue in the iterations so far. The pace in which we can develop the storyline in the scenario with GAI tools has been very useful as the Gamemaster quickly can create tasks during the game, with ChatGPT as a fast and creative assistant.

RQ2: To what extent can an experimental, structured lab setup foster students' critical reflection on the professional application of GAI programmes and foster AI literacy?

The most notable reflections are the pros and the cons for the students in using the AI programmes and the assistants in the AI lab versus in reality. "We had to be more critical to the answers and suggestions from the (AI) assistants if this really had to be published, but the AI suggested headline for this press release would be working fine" (Participant).

To some participants prompting in different ways for the tasks in the AI lab were a new learning experience: "*It was eye-opening to realize how much of a difference it makes to prompt properly.*" (Participant)

Some of the students who have been in internships, reflect on their professional use of AI assistants and how they need to feed it with information e.g. on the company values, rules of communication etc. in order to be able to get more relevant answers. They don't get that type of information in the lab (so far) and therefore the students express a limit to the use of the AI-assistant in the AI lab. They use their professional competences from real world experiences to reflect on the usefulness of dialogues with GenAI. This could indicate that it is necessary for students to have acquired some professional skills in order to build AI literacy through the game as also theoretically assumed in Figure 1.

The time factor in the AI lab is essential to many of the participants, some find the pace that automatically occurs, stressful others get motivated. "*You can get caught up in the pace. And then you might find yourself facing all sorts of tricky ethical challenges*" (Participant).

Discussion and Perspectives

The following discussion is based on our preliminary observations and elaborate on RQ2. We discuss to what extent the three elements (figure 1), we combine to foster AI literacy, are successfully balanced in the project

Professional competencies

Using professional knowledge from journalism and communication is an important part of the scenario. From our preliminary observations we can see that the realistic setup in the scenario is working. This is underlined by both educators and practitioners from both professions who

have participated in the scenario. The question is how much experience and knowledge you need to have to be able to critical reflect on the methods and practices you are working with during the scenario. This is an important question we still must examine in coming iterations – even though the preliminary observations suggest it requires some professional experience and competencies to assess the value of AI. But what will happen if we let the scenario be a part of an onboarding activity for first semester students? We assume that professional competences are central in fostering AI literacy but have still not the answer regarding the extent of these competences.

Scenario-based AI Lab

We have confirmed what other studies examine (Hanghøj, T. et al., 2017) that scenario-based learning has a huge potential also when it comes to fostering AI literacy. We have noticed that the scenario tends to be so realistic that the participants forget all about critical reflection and produce a lot of AI-generated content without a human-in-the-loop approach (Mollick, E., 2014). From our data we know that the reflection sessions throughout the scenario were challenged by the dynamics of the game and some participants were more eager being in their roles than reflecting on their actions. Several participants also mentioned a high pace in the scenario as stressful and inhibiting. In the next iterations we must find a way to adjust the pace and balance between the scenario and critical reflection.

Generative AI

There are restrictions on the use of GAI when it comes to data protection, copyright and ethics that we can handle with the fictive scenario setup. The advantage is obvious since we can let the students play with different AI-programmes that are not allowed in a real context on the school. The downside is technical issues as licenses and the question about learning to handle the programmes. From our observations and the data we learn that some of the participants are confused about the purpose of the game because they think it is about handling the AI-programmes. Beside the technical knowledge about the programmes, we must consider if more basic knowledge about AI is needed before entering the scenario. Until now we have not introduced thoroughly to basic knowledge about AI

concepts and history which is an important part of fostering AI literacy (Ng et al., 2021). This must be considered in future iterations.

Next Steps

Based on our iterations so far, the right mix of the three elements above (figure 1) is essential when it comes to fostering AI literacy. As described in the discussion we must experiment with more adjustments in the coming iterations such as working with pace, reflection breaks and basic knowledge on AI and balancing it with the demand for and expectation of the participants to learn handling the programmes.

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