Opportunities, Challenges, Tools and Helpful Relations.
Development of a Model of How to Foster Reflections in Higher Education

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ABSTRACT

This paper presents a model which can be used to help teachers to design pedagogical opportunities for meaningful reflections in higher education. Within the PBL Future initiative of Aalborg University, we worked with a group of students from different study programmes and levels. In a three-semester long process these students engaged in a series of reflective activities aimed at helping them become more aware of their professional competence developments. In an iterative process we analysed their reactions to and interactions with a set of given reflective tasks (both face-to-face and online), and with the research team. We summarise our insights into the complex dynamics of reflective processes in a model which conceptualises reflections as taking place as interplay between opportunities, challenges, tools and helpful relations, and with inspiration from the outside world.

Keywords: Reflections, reflection model, problem-based learning, higher education, competence

INTRODUCTION

"[Researcher:] When it comes to speaking with people outside the university, it's not about saying 'How am I going to make myself be the number one?' or 'How do I compete?', but of course, when you are in an interview situation, you want to…

[Student:] So, you mean, it will be more about, what you call that, more about 'How *I* will be able to do the job?', rather than 'How *good* I will be in it?'"

(Transcript talk with student Amar, February 2019)

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The above citation was part of a longer conversation between a student and two members of our research team in which they elaborated on how this student could communicate the competences that they acquired while studying to an outside audience of employer representatives. It is a good example of the reflective and transformative processes that can occur, facilitated in this case by communication, when students engage in understanding what they are capable of as individuals in a world beyond university. However, the citation also illustrates the challenging nature of the act of reflecting, and the difficulties students encounter on the journey to owning their learning experiences.

That students struggle to perceive themselves as competent and capable individuals can also be observed throughout the study programmes at Aalborg University (AAU): Although the development of transferable competences lies at the heart of AAU's Problem-based Learning (PBL) model (e.g., Holgaard et al., 2020), it seems that many students experience difficulties in translating the learning outcomes from courses and projects into reflective, personal and communicable professional competences in new situations. This is the case even though many of AAU's students are provided with space for reflection on their learning and development as part of the respective curricula. These problems point to more general challenges around students' struggles to produce reflections on their personal and professional competences at the end of their studies (e.g. Johnson & Ulseth, 2016; Roters, 2015; Scholkmann & Huckfeldt, under review), despite studying in problem-based and/or research-based curricula.

As part of a larger initiative throughout AAU we have researched the processes that students undergo when engaging in reflections around their professional and communicable competence development. In a qualitative approach, inspired by action research and design-based research methodology, students from different faculties and study programmes were invited to find their own "language of transcendence" (Ryan & Ryan, 2013, p. 246) regarding the communication of their professional competences to each other, as well as to an outside audience, being representatives of the respective target industries of their studies. Their individual reflective activities (both analogue and digital) were supplemented with face-to-face meetings with peers and facilitators, which were continuously analysed by the research team.

Besides gaining insights into students' individual competence trajectories, our engagement with the students in this project has also led us to explore and analyse the pedagogical architecture and the elements that we used to engage students in reflections. We have collected these elements, whether tacit (such as concrete tools or assignments) or ephemeral (such as conversations or concrete activities and practices), in a model for reflective practices that can inform teachers and facilitators when designing pedagogical architectures that comprise reflective elements

In the following we will present this model and its theoretical and empirical underpinnings. The model is the result of a three-semester research activity in which we worked with, and researched the reflections of, eleven students participating in our project on a voluntary basis. We see our model as a supplement to existing proposals on how to foster reflections in students (in problem-based education, and beyond); our model adds to these by focusing on the concrete practices of engaging students in reflections. Hence, the research question addressed throughout this article will be: Which elements constitute the concrete practices of facilitated student reflections, and how these can be described in order to inform the design of pedagogical architectures to engage students in reflections about their professional competence development?

THEORETICAL UNDERPINNINGS

The role of reflections in the learning process

Following relevant theorists, reflections can be seen as nothing less than what lies in the heart of any meaningful learning process (for an overview cf. Rogers, 2001). Specifically, following Mezirow (1991), reflections can be considered the cognitive, social and emotional enterprise which transfers concrete experience into abstract learning (cf. also Ryan & Ryan, 2013). However, reflections within the context of formal education must be distinguished from private or everyday reflections (e.g., Moon, 2013), with the former being "academic" or "professional" (Ryan & Ryan, 2013, p. 245), i.e., serving the purpose of facilitating students towards critically scrutinising theory and developing a professional identity (cf. also Boud & Walker, 1998).

A fair amount of the theory and research around reflections is concerned with describing potential dimensions of the content and complexity of reflection. Some theorists have put an emphasis on the *processual nature of reflections*, and classified them in terms of occurring before, during or after an experience. Examples here are Schön's reflection-in-action vs. reflection-on-action (Schön, 1983), Loughran's anticipatory, contemporaneous and retrospective reflection (Loughran, 1996) or Mezirow's thoughtful action vs. retroactive reflection (Mezirow, 1991; cf. also Rogers, 2001). Another group of theorists focuses on the *content of reflections*. For example, Mezirow (1991) identified content, process and premise as potential focus points of reflections; other authors have distinguished between reflections on learning content, learning strategies and personal beliefs/values (Jenert, 2008) or added reflections on (learning) contexts to this list (Du et al., 2020).

Additionally, there have been calls to distinguish between different levels in the depth of reflections. Qualitative distinctions are made between reflections directed towards reporting/describing, responding, relating/justifying, reasoning/critiquing and

reconstructing/discussing (e.g., Bain et al., 2002; Leijen et al., 2012) or between various levels of elaboration in the sphere of deep and transformative reflections (e.g., Grossman, 2009). Although similar to the content-process-personality continuum mentioned before, we think these types of distinctions constitute a class in itself, which can be labelled as *complexity and transformativity of reflections*. The idea of (certain types of) reflections being transformative in nature has permeated the literature on this concept for many years. A transformative reflection is seen as leading to change in individual or collective assumptions (Mezirow, 1997) – something that we were also aiming for in our project with respect to students' understanding of competences as being personal and transferable. Transformative or critical reflection requires scrutiny not only of learning content and strategies, but of one's own assumptions, values and ability to re-visit previous reflections to interpret them in new lights (Grossman, 2009; Kemmis, 1985). Therefore, circular and spiral models are advocated as leading towards this type of reflection (for an overview cf. e.g., Mills, 2014, p. 18).

Reflections within problem-based educations
In the sphere of problem-based and project-based education, reflections have held their core place within the learning process, although with a slightly different angle than in more traditional pedagogical approaches: In PBL and its relatives such as inquiry-based, research-based or challenge-based learning, reflections are conceived as occurring as an integral part of the learning process (Scholkmann, 2016).

It seems almost intuitive that, when working with complex problems, students must necessarily reflect on their existing knowledge, their use of strategies and the personal and contextual meanings and conditions they are working in. Consequently, both traditions of PBL practices (i.e., the more cognitively oriented Maastricht tradition and the more pragmatically oriented Aalborg tradition) aim not only for reflections on learning content and strategies, but for scrutiny of fundamental conceptions and underlying beliefs – hence for some form of transformative learning. In addition, reflecting upon learning experiences has recently been argued as being at the heart of students' competence development, since only through critical reflection can concrete experiences be brought into a state that makes them transferable to new situations (for an overview cf. Scholkmann et al., forthcoming).

All study programmes at AAU explicitly state reflective competences as part of the intended learning outcomes. For example, in the Bachelor of Health Technology students in the first semester are expected to reflect on and develop their own learning, and in the second semester reflect on their own learning process, the organisation of group cooperation and solutions for possible problems or conflicts in the group, an their professional role within the healthcare system.[1] In the Bachelor of Nanotechnology, students in the first semester should reflect on the study format of PBL and their

experiences with this. They should also reflect on and develop their own learning process and reflect on their professional work in connection with the surrounding society.[2] However, these reflections are mostly limited to the scrutiny of a) the application of theory to the problem at hand, b) the group process and c) the competences as a professional (cf. Lolle et al., forthcoming). What they mostly lack is a clear pedagogical vision about how a transformative and/or transferable competence reflection can be achieved (for a first exception, cf. Holgaard et al., 2021).

However, as we discovered in our work, the starting point for any reflective process in (formalised) higher education is a pedagogical architecture that offers certain degrees of structure and scaffolding (cf. also Tucker et al., 2003; Zarezadeh et al., 2009). Hence, although ultimately aiming for ambitious goals, a problem-based education can also benefit from inspiration on pedagogical elements that, very tangibly, can be implemented in order to increase the potential for transformative reflections and the acquisition of transferable competences.

Models and frameworks on how to foster reflections
The literature and research on reflection does not fall short on suggestions of how to foster reflections. Numerous pedagogical templates and models have been suggested (e.g., Coulson & Harvey, 2013; Deslandes et al., 2018; Etscheidt et al., 2012; Grossman, 2009; Güngör & Güngör, 2019; Lai & Land, 2009; O'Shea & Kearney, 2016; Plack et al., 2008; Porntaweekul et al., 2015; Runnel et al., 2013; Sen & Ford, 2011; Tucker et al., 2003; Zarezadeh et al., 2009, to mention only a few). Most of these models have been developed in direct interaction with students and are therefore highly context-bound, as are reflections themselves of course. However, the provision of a pedagogical template always calls for a certain degree of de-contextualisation (Scholkmann, 2020), and not many of the existing suggestions for models on how to foster reflections provide that.

One model that strives to provide a general framework for reflections has been proposed by Ryan & Ryan (2013), who criticised many reflection practices as lacking "necessary scaffolding or clear expectations for students" (ibd., p. 244). Ryan & Ryan (2013) further pointed out that "professional or academic reflection is not intuitive and requires specific pedagogical interventions to do well" (ibd.). This resonates with, for example, Larkin & Beatson (2014), who found that reflections in work-based learning contexts are suffering from a lack of knowledge or skills for reflection, limitations of physical reflection tools (in this case: journals), a lack of facilitation of different forms of reflection and missing suitable models for teaching and assessing reflections. As a solution to this, in their model Ryan & Ryan (2013) acknowledge the complexity of reflections and combine them with the perspective of developing from known and familiar content to unknown, new and unfamiliar/challenging content to reflect on. They also stress that is is not only a specific context upon which students should be expected to reflect, but a modelling of the context

in which they gather experiences to reflect upon (such as a more formalised learning context in their first year of study vs. a work-integrated context later on, cf. Ryan & Ryan, 2013, p. 251).

The authors position their model as a transferable template to be used across various learning contexts, and disciplines to design learning situations that allow for the integration of reflective activities. It provides a well-structured yet flexible approach to a systematic implementation of reflections into a curriculum. However, it at least in part falls short in recognising the more dynamic, tacit and interpersonal attributes of reflective processes, some of which have been elaborated on only after the model was published. For example, Foong et al. (2018) pointed out the importance and role of others in collective reflection and knowledge creation. Also, there lacks a more active integration of specifically digital tools to foster reflections. Last but not least, the model does not take a stance on the question of when/at which points in time or in time-space relations reflections can or should be positioned. The literature on reflections only discusses this aspect only indirectly (e.g., McLeod et al., 2015, p. 450), but does not elaborate on the necessity of time-spatial configurations in order for reflections to take place.

METHOD

Research context and general research design

The findings presented in this article were gathered in the context of a larger research initiative, in which future directions for the Aalborg PBL model were explored. Our research project within this initiative engaged a diverse group of students (i.e., from various study programmes and various semesters) over three semesters in a series of reflective activities. These activities were designed as to be individual, i.e., they engaged participants in reflections on their individual study experiences as well as on their personal competence trajectories (for a distinction between individual and collective reflections, cf. also Lolle et al., forthcoming). The intended outcome and closing point of these activities was a workshop in which students would be given the opportunity to present themselves and the competences acquired while studying to a group of external stakeholders (especially representatives of industries relevant to their study programmes, as well as representatives from the study boards). All participants took part in the project on a voluntary basis.

The reflective activities in which the students engaged were as follows:
- During the *first semester of the project* (spring 2018) we held three face-to-face workshops with sub-samples of the participants in which they were invited to reflect upon their competences at this point in time; specifically, participants were asked to draw a mind map on how they perceived themselves as professionals.

They then had to communicate the content of this mind map to their peers and to the research team. Participants were physically present for the workshops and could communicate and get inspired by each other's activities. They could also communicate with the research team when in doubt about the task.

- During the *second semester of the project* (autumn 2018) three reflective tasks were provided online in a collaborative platform, each approximately four weeks apart. All three tasks were designed to give students prompts to produce reflective artefacts, either digitally or physically (in the latter case, also to provide digital documentation thereof) and post them on the platform. In the first tasks students were asked to tell a short story about why they chose to study at AAU. In the second task they were invited to visualise a skill acquired from their studies by making use of one of different digital tools (e.g., a website, a sensory postcard[3], a pecha-kucha[4] presentation, a pencast[5] video or a cartoon) and in the third task they were invited to reflect on how PBL had contributed to the acquisition of this skill. Students were also encouraged first to explore the different options before choosing how to respond to the task. There were no physical meetings during this second semester.

- During the *third semester of the project* (spring 2019) one individual face-to-face reflective activity and two group face-to-face reflective activities took place. The individual activity was a talk with members of the research team on progression and competence development during their studies, together with reflections on how to communicate these towards external stakeholders. Amongst the group activities, the first was the afore-mentioned workshop with external stakeholders and the second an (not originally scheduled) internal workshop with participants and the research team. Seven external guests were invited to the official workshops (both labour market representatives and members of study boards), and the students' assigned reflective task was a five-minute pitch of themselves and their competences. Students received feedback from the guests afterwards and engaged with them in a general discussion on competences. For the internal workshop three students met with the research team in a group meeting. As a final task, participants were asked to revisit their initial mind maps and comment on their own progression and previous reflections on competences.

Methodological approach

Acknoledging the processual nature of reflection, it makes sense to collect data on reflections over a longer period. Therefore, our research approach followed a combination of different methodologies and underlying philosophies of science that integrate the idea of processuality and (iterative) developments. As a first source of inspiration we followed the paradigm of action research and its underpinnings in pragmatic theories, which are focused on action as a foundation for the conception and awareness of individual and

collective understanding (for an overview, cf. Mills, 2014). Specifically, inspired by design-based research methodologies (The Design-Based Research Collective, 2003), we followed a co-constructive approach, in which we treated each encounter between the students, the reflective task, any other persons and the research team as an instance of intervention and data-gathering that would lead to reflections on the part of students and on researchers and hence constitute an iterative process.

The second perspective was a sociocultural understanding of learning as a "result of complex interactions between people in particular social, physical and cultural contexts" (Cowie et al., 2010, p. 83), and the resulting approach to engage student through different modalities, such as face-to-face, virtual, in spoken, written and non-verbal forms of engaging students). As a third perspective the concept of peer-learning in the sense of Boud et al. (1999) was integrated (cf. Fladkjær & Otrel-Cass, 2017). An additional layer of mutual learning can be seen in the engagement between participants and the research team, and the openness on both sides to be challenged and inspired by what was coming from the other side (for a more detailed overview over our methodological approach, cf. Lolle et al., under preparation).

Participants and ethical considerations
Eleven students from five different study programmes across the five faculties of AAU participated in the study. The selection of students was targeted specifically towards creating variety in how far advanced they were in their studies, with a focus on the second semester at both bachelor and master level. Students were included from the second semester bachelor level because it was assumed that these students would already have some experience of working with PBL and with reflections as part of their studies. Students at second semester master level were chosen because at this point students at Aalborg University are expected to be highly reflective and able to articulate their competences, according to their study programmes. Additionally, most students at this point would have participated in practice semesters, where the focus demands a high degree of reflection on the individual student's contribution in practice.

All participants were informed about the objective of the study as well as about the planned activities and their expected involvement. They consented to participation under the terms defined by the Danish version of the European General Data Protection Regulation (GDPR), that is, in the knowledge of their ownership of their data and the permission granted to the research team to present them when cleared of personal and sensitive information. All students will be referred to under pseudonyms in this article.

Data basis and analysis strategy
Following our research approach, we analysed what the students did during the three semesters and in interaction with their assigned tasks, the research team and external

stakeholders (in semester three) in iterative reflective cycles in our team. Again, we followed here the elaborations of Cowie et al. (2010) who recommend a holistic, rather than strict triangulatory, approach to students' voices in such research projects, and call on researchers to analyse them with a focus on emergent topics and patterns. In this sense, we treated students' conversations and artefacts not as realities but interpretations thereof and validated them through multiple feedback rounds both with the research team and with the students which involved the sharing of our interpretations, and subsequent checking of whether we had understood them correctly. Extensive material gathered over the course of the project served as the basis for this. This material comprised: transcripts of the video recordings of all workshops held during the projects; documentation of all visual or verbal or blended artefacts (such as websites, sensory postcards, comics etc.); and field notes on several levels of reflection (such as direct field notes from the workshops, reflective field notes on talks with students and transcripts of audiotaped reflections during the analysis of the different materials).

FINDINGS: OTCR ELEMENTS OF THE REFLECTION PROCESS

In the following we will present the outcomes of the above analysis with respect to a set of recurring elements that emerged as central to students' reflective practice and the fostering of reflections. These should be understood as recommendations to inform the design of pedagogical architectures to engage students in reflections about their professional competence development. These elements and their interplay are systematised in the Opportunities, Challenges, Tools, Helpful Relations, and Inspirations (OCTR) model.

The OCTR model as a whole
The OCTR model consists of an inner dimension, in which there is an interplay between *opportunities*, *challenges* and *tools* to and with which to reflect. These need to be seen as constituting an inseparable triangle which fuels reflective dynamics. These reflective dynamics are evolving on the grounds of *helpful relations*, which provide both a basis and a driver. Moreover, these dynamics are conceptualised to be open to an influx of *inspirations and impulses from the outside world* – from students' everyday experiences and encounters, including in connection with their project work. These elements are not to be conceived of as fostering reflections independently but must be understood as interacting entities. Therefore, we have decided to formalise them in a model in which we assume that in order to foster students' reflections, all elements need to a) be present in an adequate pedagogical form and b) be actively set into relation with one another (cf. figure 1).
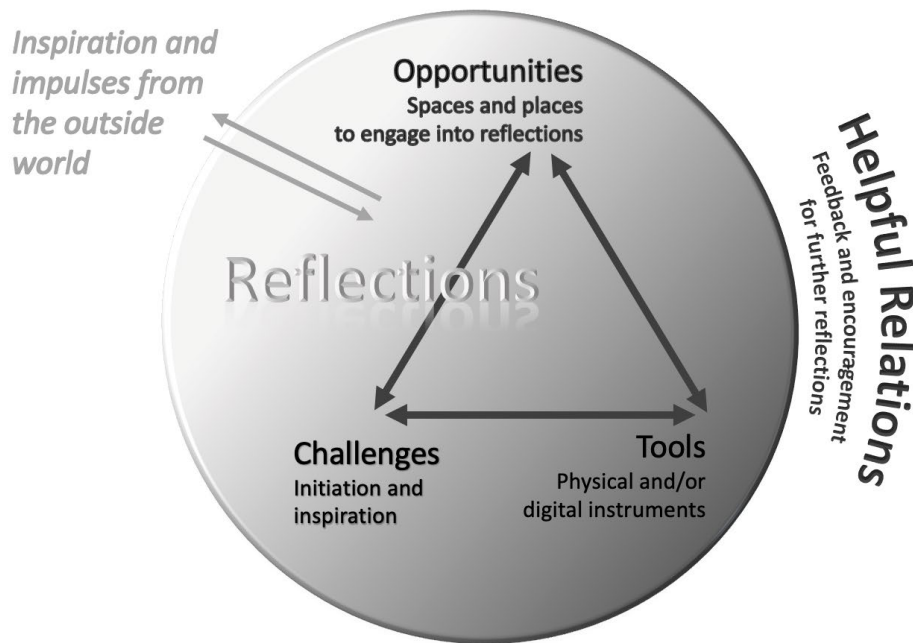
Figure 1. The OTCR model.

Description of the five elements

Opportunities

The first element we propose is distinct time-spatial configurations or opportunities, in which reflecting is expected and possible for students in formalised higher education settings. This can be the timing of a 15-minute activity within a lesson, a formal or informal reflection-talk or any other form of provision of an opportunity to engage in reflections. The notion of materiality and the provision of distinct time-spatial configurations as part of reflective learning processes can be found in literature on portfolio work (e.g., Chen et al., 2005). However, coming from the angle of models to foster reflection, none of the frameworks that we studied has pinpointed this aspect, explicitly. Partly this seems to be due to the fact that the provision of opportunities to reflect is often conceived as being inherent within other aspects, namely the provision of challenges and tools (e.g., Kandiko et al., 2013; Plack et al., 2008). In at least one recommendation, where reflections are conceived as taking place in group settings, the provision of opportunities can be interpreted as being implicitly present through these defined group meetings (Zarezadeh et al., 2009). However, it can be argued that a merely implicit provision of opportunities to reflect is probably not enough for students to understand the assignment, and that this can lead to the afore-mentioned lack of clear scaffolding that reflections need in formalised higher education settings, cf. (Ryan & Ryan, 2013).

Throughout our project it became clear the provision and clear communication of distinct time-spatial configurations in which reflection was expected and possible constituted an important, yet also contested element, in students' processes. The production of reflective artefacts during the project was, on the one hand, happening clearly as a response to the provision of time and space (during a specifically scheduled workshop, in a different channel on the digital platform etc.). On the other hand, participants were also prone to forget about these times and spaces (demonstrated in late deliveries, no-shows to workshops), which we interpreted as an effect of students economic behaviour, which led them to allocate more attention to assignments that promised tangible gains in the form of grades (Biggs & Tang, 2011).

However, although the provision of opportunities was met with mixed enthusiasm, students evaluated the experience as meaningful in the long run. Through several oral communications we learned that participants perceived a difference in how we engaged them in our project compared to what was required of them in their regular learning processes, and that they had been deprived of this kind of work in their study programmes. As one member of the research team noted in their field notes:

> *"Very interesting (and long) talk about the competences she is getting from [her study programme]. (...). She knows that she has gotten a lot of competences out of her studies, but it is difficult to put it into words, and she thinks that study programmes should also teach the students to be reflective of the knowledge they get."* (Field notes researcher 3 on talk with student Johanne, February 2019)

During the final workshop one student added to this that the project had made them more reflective of the impact of their study programme on their competence development. They stated:

> *"The project has been useful in helping me to present, to become more reflective, to find out what the study has given me personally. I would also like to have made a website [that I could use to present myself]."* (Transcript final workshop, April 2019, student Malene)

Challenges

The second element we propose is the provision of challenges that engage students in reflections. Challenges are a classical approach to engage students in (structured) reflections by providing them with an inspiration, question, puzzle or other cue to reflect upon. Many models and approaches to reflections operationalise challenges in the form of questions (e.g., Zarezadeh et al., 2009) or reflective prompts (e.g., O'Shea & Kearney, 2016). Other reflective challenges have also been described, for example the use of

concept mapping to foster reflection on learning content (Kandiko et al., 2013), the elicitation of metaphors (Sykes, 2011) or the implementation of virtual action learning for medical students (Plack et al., 2008). Also, challenges are often presented with progressive complexity, for example following Ryan & Ryan's (2013) model (cf. Larkin & Beatson, 2014) or Leijen et al.'s (2021) levels of reflection (cf. Runnel et al., 2013).

In our project challenges were conceptualised as a series of reflective tasks, which provided a variety of descriptive, reflective and critical questions. An important aspect of our challenges was that the students should be able to see a benefit of engaging with them for themselves, and that this would create momentum for them to continue working with the challenges independently. We saw this approach come to life in the first and third semester of the project: The very first challenge, the mind map drawing activity, resulted in conversations such as the one transcribed at the beginning of this article. Moreover, when students were invited to re-visit their mind map after more than one year, this triggered some powerful modifications. One student added seven *post-its* to their previous competence descriptions. The interesting phenomenon here was that, while in the first mind map this student described competences mostly rooted in concrete activities and contexts (such as "family", "study" or "voluntary work"), in the amendments this student both physically and conceptually added a new layer focusing on values, identity and projections of their professional future. In this sense, this student, through engaging with a reflective challenge, came to reflections on their competence that were much more elaborate and personal (mind maps 1 and 2, student Malene). Another student decided to remove certain aspects from their original mind map (on personal aspects) and explained that they experienced a shift in relevance during their reflections (transcript final workshop, April 2019, student Amar).

Challenges can be difficult, though, as demonstrated when our participants were confronted with the task of presenting themselves to the external stakeholders. While some struggled with what to present at all, others were concerned with how to make a good impression on an important external group. This led us to offer a preparatory talk for this assignment with someone from the research team, which several participants made use of (and which led to integration of the element *Helpful Relations* into our model, cf. 4.1.4). What we also saw, though, was that – with or without our help – students experienced agency in meeting this challenge – or, as our participant Malene put it: *"I talked with the study board member about Logbook as a recurring thing on my education. Cool to be heard."* (Transcript final workshop, April 2019, student Malene). Additionally, one member of the research team after the event wrote down the following reflection, which mirrors both the challenging nature and the helpful relations within the experience:

" (…) I found it very interesting how
- the students wanted to present themselves, their competencies, their products and
what they'd learned
- The external people tried to support the students' experiences. (…)"
(Excerpt of field notes by researcher 4, reflecting on the stakeholder workshop,
February 2019)

As a first conclusion of our challenging students during this project we can state that in
fostering reflections challenges should be considered as being much broader a concept
than is the case in existing reflection models. Currently, challenges are often implemented
as questions or prompts for mainly cognitive reflections. By also integrating personal
topics, non-linear approaches and iterations as well as multi-modal and non-verbal forms
of expression, it became possible to use challenges more creatively and to enrich
reflections with aspects of values, emotions and personal growth. A second conclusion,
emerging from the observation how the students engaged with challenges over the course
of the project, is that what is perceived as a challenge can vary in different situations and
contexts. Since students in a formal educational setting are working under pressure and
high constraints, teachers should explore carefully which challenges fit with students'
everyday realities, their motivations and goals, and search for ways to integrate these
aspects when designing meaningful reflections.

Tools
The element "tools" relates to the use and construction of reflections through any kind of
artefact. In the literature on reflections, by far the most common tool is the use of personal
journals (e.g., Bain, Mills, et al., 2002; Pavlovich, 2007), which has gained much traction
especially in its digital form (e.g., Schwendimann et al., 2018). Other tools have been for
example voice-over photos (Mulder & Dull, 2014) or concept mapping (Kandiko et al.,
2013). Often, reflection by means of tools is documented and analysed by looking at the
resulting artefacts. The most common way to collect these is the portfolio (Scully et al.,
2018), often in digital form and through the use of respective software (e.g., Barrett, 2004;
Jenson, 2011; Simatele, 2015; Yancey, 2009). However, it needs to be stated that the
portfolio is not necessarily a tool in itself but should be treated as a meta-tool to collect
artefacts created through more concrete tools such as the ones mentioned above.

In our study we made use of both physical and digital tools which covered a broad variety
of potential forms of expression. Some of them were more intuitive, others were more
structured. The value and relevance of these tools to foster reflections can be seen in some
of the students' products. For example, during the second semester of the project, in which
students were provided with challenges on an interactive platform, they engaged with
these both in digital as well as in analogue/blended forms, by posting written answers in

the chat, creating a homepage, a sensory postcard and a Pencast video. For the presentation, two other students also tried out Flipsnack[6]. We could see variation in students' use of and preference for specific tools and noted that they mixed the tools according to their needs or specific circumstances. For example, one student whose participation overlapped with a periodabroad had a bad internet connection and would draw a cartoon and upload this to the platform.

In conclusion, we can say that at the core of this element lies not the prioritisation of specific tools, but the importance of the availability of a variety of tools, which should be in accordance with the specifics of the respective learning context, and pedagogical considerations to facilitate students in their exploration and choice of the tool that best suits their reflective practices. Hence the importance of trying out different kind of tools.

Helpful relations
Throughout our work with the students and the application of our research methodology it became clear that reflections can only develop their full potential when they are embedded in a network of helpful relations coming into play at any time in the process. By relations we mean any kind of social interaction and contact that provides resonance and feedback to the individual student and helps to mirror their reflective thoughts.

The reflection literature is somewhat ambiguous when it comes to the value of positioning relations as part of reflective practices, and on specifying which kind are considered helpful: Some authors emphasise the role of collective reflection as a transcendence of the individual-focused, cognitive-heavy reflection approach (e.g., Kandiko et al., 2013). Here a group of co-students is considered the entity to relate to, for example in the context of a service-learning design and reflections on students' professional identities (Reed & Koliba, 1995). The same and other authors have also pointed out the importance of adequate support and facilitation by a supervisor, who can serve as a role model and guide reflections through posing questions (Foong et al., 2018; Koole et al., 2016). However, there is not all too much theoretical underpinning about why social relations are so important in order to reflect, or which kind of relations should be prioritised. Based on theories on facilitation as instrumental for reaching new zones of development (Tharp & Gallimore, 1995; Vygotskij & Cole, 1981) it can be argued that more experienced peers or supervisors should be considered specifically as helpful for reflections (for the scaffolding role of teachers cf. also Siemon et al., 2018).

This assumption is supported by the evidence we were able to collect during the project. Especially when it came to condensing the reflective activities that took place during the second semester into more durable documentations to be presented to external stakeholders, it became very clear that the students needed more than just support in performing the tasks. They needed a reaction from the research team, that would help

them to progress in their reflective process and specifically to transform their world views, for example about what a competence is for them, personally. A very impressive example of this took place during one of the semi-formal talks that were offered to the students between semester two and three. Here participant Kasper met with two members of the research team and discussed how to present himself and his competences. As one member of the research team present at this meeting noted in their field notes:

> *"One of his most important questions was how he as a third semester student can talk about competences that he only will have acquired at the end of his studies. (...) it was nice to see how also during the talk reflective processes were going on and he grasped the idea of what we are aiming with in the project."* (Fieldnotes researcher 2 on talk with Kasper, February 2019)

In this sense helpful relations (especially with more experienced counterparts such as members of our research team) can also be understood as instrumental in facilitating students towards more metacognitive and transformative reflections about the nature of competences, their own trajectories and ultimately their own reflective processes. Of course this requires a certain degree of (mutual) trust, which in our project was achieved by the fact that students knew that their participation was not tied to any formal assessment or grading. As a conclusion we can say that, from what we discovered during the project, the helpful relations in many cases were the instance when reflections started to become personally meaningful to students. In this sense, they can serve as scaffolding towards more complex or thematically different reflections and enrich more cognitively structured approaches with social and emotional value.

Inspiration and impulses from the outside world
Students, as autonomous individuals, will bring in their own experiences into the formal educational context, and whether intentional or not their reflections will be influenced and inspired by this. Therefore as a supplement stemming from our work, we want to propose consideration of inspiration and impulses from the outside world when fostering reflections, since these happen in interaction with an environment that is not part of the pedagogical architecture in itself. Some suggestions to foster reflections take this into account, already, by integrating challenges created through real-life situations. This is the case specifically in the context of professional education and in-practices studies. For example, prompts and questions directed at reflecting upon one's professional identity, community and role have been used (Zarezadeh et al., 2009), as has reflecting on critical incidents (Larkin & Beatson, 2014) or reporting on experience during practice placements (Deslandes et al., 2018).

Our project made use of impulses from the outside world, for example when, at the beginning of the project we asked students to draw a mind map about themselves and their competence, and use their previous education, family, hobbies etc. as possible inspirations. However, students also contributed their own inspirations, which surprised the research team more than once. For example, student Johanne made several references to their personal beliefs and values as both source and target of their competence development, and student Henriette would draw a cartoon in response to one of our impulses, making use of drawing skills that were not originally communicated as a tool within the project's methodology. Finally, and although this lies outside the empirical information we gathered during the project, we think it must be assumed that reflective dynamics will also feed back into the outside world. We have decided to integrate this into the model in order to remind teachers, educators and educational designers working with reflections that what is happening during reflections might well have impacts beyond the formal educational context.

CONCLUDING REMARKS

In this paper we have presented our suggestion for a model on how to foster reflections in higher education. The model was conceived on the basis of our own iterative reflective work and process analyses with students from different education programmes and varied study years, which gave us an understanding of elements that can be instrumental in a pedagogical architecture regarding reflections which are not specifically tied to set educational goals or disciplinary learning outcomes. In this sense, we would like to propose our model as a general framework of elements and their interplay which can be applied and amended in different directions.

Our model was developed based on multimodal data and iterative process analyses. Whilst this has been an enlightening journey, our findings are still limited to a relatively small, self-selecting group of students in an extracurricular activity. It needs to be further explored how similar reflective dynamics play out when the OCTR elements are being used as part the formal curriculum. Also, in its current form, our model did not find a clear positioning for one element in reflection described in the literature, i.e., the use of *activities* such as role plays (Runnel et al., 2013) or reflective group discussions (Reed & Koliba, 1995), possibly because our project did not prioritise these types of activities. However, we do not doubt that reflective activities such as those mentioned are a relevant element in the process, especially in the context of collective reflections and when stressing the social nature of this process. For the future, there needs to be a discussion of their place in a holistic reflective model can be.

Another point for future research and elaboration should be that an element within a reflective pedagogical architecture can sometimes serve more than one function. For example, it is somewhat ambiguous whether the concept mapping described by Kandiko et al. (2013) is a challenge (i.e., stimulating the reflective dynamic) or a tool (i.e., documenting the reflection). Also, the model by Runnel et al. (2013) can be read as integrating challenges, tools and opportunities. However, here we want to stress again that also in our conceptions the elements of opportunities, challenges and tools are to be seen as intertwined, and that for reflections to take place they all three need to be present, although not in any specific order. Their analytical separation should be seen as serving the design of a pedagogical architecture and the provision of reflections within a programme or curriculum.

As a last point we want to draw attention again to the fact that reflections within a formal educational setting such as higher education always walk a tightrope between engaging students in meaningful conversations, and engineering assessment-oriented affordances to which students will only extrinsically react to. However, we hope that a model such as ours can help to create a relevant pedagogical architecture that can help to prevent the creation of mere "reflective zombies" (de la Croix & Veen, 2018, p. 1).

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