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Transformative AI Agency

How Students Negotiate and Collaborate with Generative AI in Higher Education

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Abstract

As generative AI tools such as ChatGPT enter higher education, questions arise about how students can use them not merely instrumentally but as catalysts for collaborative and reflective learning. This study investigates how master's students engage with ChatGPT in group-based academic tasks, specifically when working with complex course literature. Drawing on Vygotsky's concept

of double stimulation and Engeström and Sannino's theory of transformative agency, we analyze how students collectively navigate AI-generated responses, challenge assumptions, and reframe understanding. The data stem from an exploratory case study in a Danish university course and include group discussions, ChatGPT logs, reflections, and focus group interviews. Findings show that ChatGPT mediates not only as a resource but as a mediating artefact that provokes resistance, negotiation, and generative questioning. Over time, students began to use technology not just for answers, but to explore and question ideas together. The study contributes to research on AI in education by highlighting the role of pedagogy in enabling transformative agency through Generative artificial intelligence.

Keywords: Transformative agency, Double stimulation, Generative AI, Higher Education, ChatGPT

Introduction

As generative artificial intelligence (GenAI) tools like ChatGPT become increasingly integrated into higher education, there is a growing need to understand how students use these technologies in pedagogically meaningful ways. While research highlights benefit such as personalization, efficiency, and language support (e.g., Tillmanns et al. 2025; Kasneci et al. 2023), concerns remain about superficial use and the erosion of critical thinking and academic integrity (Cotton et al. 2023; Yang 2024). However, most studies focus on individual use and overlook how students collectively engage with GenAI in transformative learning (Bruun et al. 2025; Yang 2024). Recent work frames GenAI as a cognitive partner that supports explanation, feedback, and reflection, contingent on transparency and trust (Dalsgaard and Prilop 2025; Bruun et al. 2025; Jensen and Dau 2025). Building on this and on recent research on GenAI as a mediator of collaborative knowledge construction (Kaup et al. 2025), we shift the lens from individual usage to collective meaning-making in scaffolded, collaborative settings in higher education. Drawing on socio-cultural theories, we examine how GenAI as a mediating artefact not only supports cognition but also shapes how knowledge is produced, shared, and challenged in collaborative learning. As Paavola and Hakkarainen (2021) argue, technologies can act as

epistemic artefacts: they structure inquiry and become objects of joint reflection and development, especially when embedded in dialogic, object-oriented collaboration. Rather than treating ChatGPT as a static information source, we investigate how it enters the dialogic space between students, as a tool, a problem, and a trigger for negotiation. The research question guiding this article is: *How do students negotiate ChatGPT's role in collaborative learning processes, and how does this engagement support transformative agency?*

To investigate this, we draw on Vygotsky's (1978) concept of double stimulation and Engeström and Sannino's (2010) theory of transformative agency, which together provide a framework for understanding how disturbances in practice, such as ambiguous GenAI outputs, can trigger collective reflection, negotiation, and reconfiguration of learning activity.

Theoretical framework

This study builds on cultural-historical activity theory (CHAT) and conceptual developments around transformative agency and double stimulation. Following Vygotsky's (1978) notion of mediated action, human agency and learning are understood as situated, tool-mediated, and fundamentally collective. From this perspective, artefacts such as GenAI become not just tools for information retrieval, but mediating instruments that shape cognition, interaction, and participation.

Transformative agency is defined as the capacity of individuals or groups to break away from the given frame of action and take the initiative to transform their activity (Virkkunen 2006; Engeström and Sannino 2010; Sannino 2020). Haapasaari and Kerosuo (2015) further conceptualize transformative agency as a process that unfolds through collective negotiation and reflection, often sparked by tensions or disturbances in practice. Drawing on Vygotsky's (1978) concept of double stimulation, they argue that such disturbances (first stimuli) may generate uncertainty or breakdowns, which can trigger new forms of mediated action using second stimuli, cultural tools, concepts or collaborative strategies that enable expansive sense-making and coordinated action.

In this study, ChatGPT is examined both as a source of disruption and as a potential mediating artefact. When its responses are perceived as incorrect, superficial, or ambiguous, they function as first

stimuli that interrupt students' meaning-making. In turn, students create second stimuli in the form of prompts, questioning strategies, or peer dialogue. These stimuli help reframe the task, clarify concepts, and foster critical engagement. Learning is thus not only seen as acquiring knowledge, but as the collective reshaping of technological tools in practice (Haapasaari et al. 2016; Engeström 2001).

Importantly, the pedagogical design of the course also plays a mediating role. As argued by Paavola and Hakkarainen (2021), pedagogical design can support expansive learning by cultivating shared epistemic objects and knowledge practices that promote sustained collaborative inquiry. In our case, group-based discussions and the collaborative use of ChatGPT supported students in articulating concerns, sharing divergent views, and exploring alternative approaches. This process, we argue, is best understood through the lens of transformative agency, as students respond to disturbances and actively redefine their learning activity.

Methodology

This study is based on an exploratory case study drawn from qualitative methods. According to Yin (2014), exploratory case studies are suitable when outcomes are not predefined. The aim is to gain an in-depth understanding of a complex social phenomenon. In this study, we explore how GenAI can facilitate collaborative work between students on course literature and as a mediating tool. Rather than testing a hypothesis, we aim to look at how GenAI tools might support or challenge students' engagement with academic texts. The study explores how students' group-based interactions with GenAI contribute to the emergence of transformative agency in their understanding and negotiation of course content.

Case and context

The study was conducted during a master's-level elective course on *Computational Thinking and Digital Literacy* at a Danish university, part of the master's program in ICT and Learning. The course consisted of five sessions, each four hours long, held during 2024. Ten students (four males, six females) participated. Before each session, students had access to assigned readings. Each session included a lecture followed by collaborative tasks related to the session's

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theme. These tasks culminated in a collective exploration of the literature using ChatGPT. To protect student data, the university provided secure laptops with ChatGPT Enterprise access. This ensured that the chatbot could only access uploaded course literature and not Internet-based information. Over time, the dataset was expanded to allow backward searching across previous readings. Table 1 shows the topic of each of the five course sessions.

Session	Theme
1	The computational future: Introduction to computational thinking (CT) and its historical roots
2	21st-century competencies and CT, with a focus on algorithmic thinking and Brennan and Resnick's model
3	Creativity, problem-solving, and abstraction: Comparing human and machine thinking
4	Computational empowerment and CT in (and beyond) the workplace; gender and stereotypes
5	CT in educational contexts: Broader reflections and critical perspectives

Table 1. Topics for each course session.

Students answered teacher-designed questions during each session and then generated their own prompts for ChatGPT based on the session literature. A collaborative model (Figure 1) structured the sessions, with student dialogue mediated by ChatGPT responses and prompts. The model illustrates how these interactions unfolded in cycles: students discussed assigned readings, posed questions fined their prompts or perspectives. This process created a dynamic interplay between human dialogue and AI mediation, designed to support collective reflection and shared meaning-making.

Figure 1. A didactic collaborative model

During the five course sessions, students worked in rotating groups of 2 to 4 participants, engaging with ChatGPT for 20 to 26 minutes

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per session. Group size and composition varied from session to session to support collaborative exploration of the course literature. The didactic design intentionally alternated between rotating group compositions, scaffolded reflection, and open-ended prompting. This cyclical structure aimed to create epistemic variation and collective ownership of inquiry. Rotating group members across sessions exposed students to diverse interpretative practices and amplified moments of negotiation and reflection.

Data collection

The dataset consists of five types of empirical material collected during the course: (1) audio recordings of group discussions (one per session), (2) the ChatGPT prompts written by students, (3) the corresponding AI-generated responses, (4) two focus group interviews conducted at the end of the course, and (5) written reflections submitted by students after the final session. The focus group interviews were carried out by researchers who were not involved in teaching the course to ensure transparency and reduce potential bias. During these interviews, students were invited to reflect on their experience with GenAI. They were also invited to discuss ChatGPT's role in supporting collaborative engagement with academic literature. All audio recordings were transcribed using Whisper (Larsen 2023) and reviewed manually. Informed consent was obtained from all participants, and all data were anonymized and handled in accordance with ethical research standards (Creswell and Creswell 2018). Throughout the article, participants are cited anonymously (e.g., S1, S2).

Analytical approach

The analytical strategy consisted of two complementary strands: an inductive exploration followed by a theory-driven deductive analysis (Creswell and Creswell 2018). The first strand involved the inductive coding of focus group interviews and students' written reflections. This allowed themes to emerge from the material itself, providing insight into students' experiences and reflections on GenAI. These themes included perceived challenges, collaborative dynamics, and changing roles in relation to academic knowledge and course content.

Building on these emerging patterns, the second strand employed deductive coding using the six dimensions of transformative agency developed by Haapasaari et al. (2014): resisting, criticizing, explicating, envisioning, committing, and taking action. These categories were used as *sensitizing concepts* (Blumer 1954) to trace how students navigated moments of uncertainty, negotiated meaning, and reconfigured their practices in response to AI-generated output and peer dialogue.

This dual approach enabled a richer understanding of how pedagogical design and technological mediation shaped students' transformative agency development across the course. Table 2 presents representative examples from the empirical material, illustrating how the six dimensions of transformative agency (Haapasaari et al. 2014) were manifested in students' interactions with GenAI.

Type of Transformative Agency	Quote	Explanation
Resisting	S1: I think I just have these everyday routines where AI hasn't really been involved before... so I don't see any reason to start integrating it now.	The student expresses rejection of the tool and resists its integration into the learning activity.
Criticizing	S7: If there aren't any reliable sources behind it, you should probably be more critical of what it gives you.	The student offers a critical evaluation of AI's output, pointing out ethical and epistemological concerns.
Explicating	S3: I basically just ask it to summarize the key points and theories in the text… I like having those notes so I can look at them later.	The student explains how GenAI supports internal reasoning processes and makes tacit knowledge explicit.
Envisioning	S6: I could imagine using it, say, in a theory of science context. What would make sense? What kind of take should we apply? I imagine it could offer some suggestions that we could then discuss in our group.	The student imagines new, constructive roles for GenAI in their learning process.

Table 2. Examples of Transformative Agency

Table 2. Examples of Transformative Agency - continued

Type of Transformative Agency	Quote	Explanation
Committing	S9: I think you could get through an entire degree using it for everything.	The student articulates an intention to adopt GenAI as a tool in their future study practices.
Taking Action	S2: There were times when we had to think carefully about how to structure the prompt in the right order to get the kind of response we actually wanted.	The students will modify their behavior based on insights from the collaborative process, actively shaping Gen AI´s inputs.

Findings

Our analysis has generated three themes that illustrate how students' use of ChatGPT evolved from initial skepticism and critique to creative exploration and dialogic reflection. These themes represent different, yet interrelated, expressions of transformative agency.

Theme 1: Challenging AI Interpretations

At the outset of the course, many students expressed trust in ChatGPT's responses, often accepting its interpretation of the course literature without extensive questioning. However, this passive stance shifted as they encountered errors, ambiguities, and limitations in the AI output. These moments triggered instances of *resisting* and *criticizing*, two early forms of transformative agency.

One student reflected on how ChatGPT's explanation of key concepts became confusing and overly verbose: "And abstraction, for example, is about filtering out all the irrelevant parts. […] Because there's just so much irrelevant stuff when you use ChatGPT and have a long thread. […] There's really a lot that needs to be broken down. […] So, we get into decomposition to extract what's relevant." (S3). Here, the student resisted simply accepting the AI's phrasing and instead engaged in analytical unpacking of its output. This moment of breakdown, particularly concerning a central analytical concept, marked a turning point where ChatGPT was no longer treated as an authoritative source, but rather as a problematic artefact requiring critical evaluation and collaborative reinter-

pretation. Another participant reflected on the risk of over-relying on GenAI and becoming cognitively passive: "You might become a bit lazy, in a way, just knowing you have that option. […] It also takes a bit of self-discipline—not to let it take over completely." (S7). This quote illustrates a form of *criticizing*, where the student not only questions the tool's influence but also reflects on their own engagement with it. The comment signals a growing awareness of how GenAI may affect study habits and learning processes.

In some cases, resistance emerged collectively, as students questioned ChatGPT's authority in group settings. When responses seemed too narrow or misaligned with the literature, students paused to critique and reinterpret them together. These moments of shared resistance shifted the tool's role from answer provider to a prompt for collective inquiry, revealing how critical reflection and meaning-making can emerge through peer dialogue and negotiation.

Another key insight was that limitations in AI output sometimes led to productive breakdowns. When ChatGPT delivered vague or partial responses, students were prompted to clarify the question but also analyze their own understanding. As one participant put it: "We prompt it, and it gives us some thoughts back, which we then sit down and discuss further." (S2). This type of joint interpretation echoes what Haapasaari et al. (2014) describe as a reconfiguration of one's role in the activity system. Here, resistance and ambiguity become a starting point for deeper articulation and group-level reflection.

Theme 2: Generating Understanding

While the first theme highlights moments of resistance and critique, the second theme shows how students moved beyond opposition and experimented with ChatGPT in more constructive and exploratory ways.

As the course progressed, students shifted from using ChatGPT simply to retrieve information toward using it as a tool for generative exploration and conceptual play. Prompting evolved from a technical task into an epistemic practice, where prompts were strategically rephrased, challenged, or even deliberately manipulated to elicit surprising or more nuanced responses from the AI. This shift illustrates a movement from surface-level interaction to deep

engagement, marked by envisioning new learning opportunities and taking initiative in how technology was utilized. This development is evident in both students' reflections and in the group discussions. One student described how she started using prompts not just for answers, but to provoke reflection: "I started writing more provocative prompts to see if I could get a different kind of answer. It was almost like playing with it to see what it would come up with." (S6). This kind of experimentation demonstrates envisioning, a willingness to reimagine what the AI tool could do in the learning process. Students were no longer merely following instructions or verifying content; they were reshaping tasks and actively using AI to rethink and challenge dominant interpretations.

A group of students critically reflected on representational bias in image-generating AI. When asked to create an image of a nurse, the output confirmed stereotypical gender roles: "I asked for an image of a nurse, and it was a woman. […] So, it really picks up on gender stereotypes." (S7). This observation led to further interrogation of how the system reproduces cultural assumptions. One student noted a contradiction when the AI refused to generate an image of a homosexual person, claiming it would be discriminatory: "But what it had just done was also, in a way, discriminatory." (S7). Rather than accepting these outputs passively, the group used them as a starting point for critical discussion about normativity and bias in AI systems. These reflections illustrate how students reframed AI tools. They did this by not merely following instructions, but deliberately questioning, repurposing, and challenging assumptions embedded in technological design.

In some groups, the prompting process became collaborative. One student emphasized the value of collaborative learning, noting: "I'm a strong advocate for learning together, because you get so much more out of it than working alone. You can build on each other's thoughts, ideas, and even critical reflections." (S6). This highlights how *taking action* was not only individual but collective, shaped by peer dialogue and the co-construction of knowledge. Prompting was no longer a solitary act; it became an emergent practice embedded in shared reflection. These examples demonstrate how students moved from compliance to creativity, from consuming answers to curating questions, and from isolated prompt-

ing to collaborative inquiry. This shift reflects a more explorative and agentive approach to learning, where prompting becomes a dialogic and meaning-making practice.

Theme 3: Mediated Reflection

The third theme captures how these emerging practices culminated in a deeper form of mediated reflection, where students appropriated ChatGPT as a dialogic partner in meaning-making. We observed how ChatGPT evolved from a static tool to an active dialogical partner in students' collaborative reflection. Rather than simply generating content, AI became a third voice in student dialogues. It mediated their collective reasoning and supported a meaning-making process that transcended individual perspectives.

As several students explained, their interactions with ChatGPT were not isolated but embedded in a collaborative dialogue. One student reflected: "We came up with these questions together collaboratively. Even though AI provides the answer, we're really working together on it." (S5). Another noted how this joint inquiry opened space for deeper engagement: "It also gave rise to new questions… S5 came up with some real gems." (S8). These examples illustrate how prompting evolved into a shared activity, where the students explored and negotiated the AI's responses. In this context, students began to see collaborative AI-supported reflection not merely as a task, but as a meaningful way of thinking and learning together. Their engagement shows signs of reflective practice, while the articulation of tacit ideas in dialogue with AI responses points toward explicating processes. Another student emphasized how the course design's openness contributed to this dynamic. The didactic framing legitimized experimentation and reflection: "And it's also nice to be given permission by the instructors, because then you don't feel like it's terrible or stupid, or whatever you'd call it." (S5). In this quote, we see the coupling between didactic design and transformative agency. We also see how creating a safe space allows students to take intellectual risks and engage in shared reflection. This supports the notion that the transformative use of AI is not solely dependent on the tool itself. Instead, it depends on how it is socially and pedagogically situated.

Concluding Remarks

This study shows how well-scaffolded pedagogical processes can support collective, reflective learning with GenAI, rather than GenAI itself being the driver of transformation. Our analysis shows how students moved from passive acceptance to critical engagement, from simple prompting, and from individual reasoning to collective reflection. Across the three themes, ChatGPT functioned not merely as an informational resource but as a mediating artefact (Vygotsky 1978) that shaped meaning-making processes. It helped students articulate uncertainties, surface implicit assumptions, test interpretations, and co-construct understanding in dialogue with peers. These moments often followed a pattern of double stimulation (Vygotsky 1978): flawed or ambiguous AI responses created disturbances (first stimulus), which students then responded to through peer dialogue, revised prompts, or conceptual tools (second stimulus). These mediated actions enabled them to reframe problems and transform their engagement with course content. This dynamic aligns with Paavola and Hakkarainen's (2021) notion of epistemic artefacts, tools that support cognition but also become objects of inquiry and development within collaborative practices. Rather than simply using GenAI to retrieve information, students appropriated it as a boundary object for exploring, contesting, and reimagining knowledge. Their ability to do so depended strongly on prior engagement with disciplinary concepts and the pedagogical framing of the course. This underscores a central finding: meaningful interaction with GenAI requires both conceptual readiness and a social infrastructure for inquiry.

While earlier studies have highlighted AI's role in supporting individual reflection and summarization (Cotton et al. 2023; Kasneci et al. 2023; Tillmanns et al. 2025), our findings extend this work by showing how transformative agency can develop when students use GenAI to challenge, reframe, and act on knowledge together (Haapasaari et al. 2016). Importantly, prompting evolved into a dialogue practice embedded in collective reasoning, where students explored ideas and reconfigured the role of technology in their learning. At the same time, the study revealed tensions. Some students expressed concerns about overreliance on GenAI and offloading critical thinking. As one participant noted, "it's easy to let the tool do the work." This highlights the need for didactic designs

that support not just access to GenAI but its thoughtful appropriation. Educators play a key role in fostering environments where experimentation and epistemic risk-taking are legitimate.

This study was exploratory and context-specific, with a small sample, and thus cannot support broad generalizations. However, its in-depth, practice-based insights will contribute to the growing body of research on how GenAI mediates learning. Future studies could explore whether similar dynamics occur across disciplines, platforms, or cultural contexts. Longitudinal or comparative work may also reveal how students' agency with GenAI evolves over time. In sum, this study shows how GenAI can support collective, reflective learning when embedded in well-scaffolded processes. Rather than replacing human reasoning, it became a generative element that helped students ask better questions, challenge assumptions, and engage deeply with knowledge and peers.

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