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# Faculty experiences with active student engagement in online doctoral courses during the COVID-19 era: challenges and opportunities—a qualitative study

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**Objective:** During the COVID-19 pandemic, universities quickly transitioned from campus-based to online education. However, there is limited insight into how faculty members experienced this transition, particularly in doctoral courses where active student engagement is crucial. This study aimed to explore faculty members' experiences in promoting active student engagement in online doctoral courses during the COVID-19 pandemic.

**Methods:** A qualitative, inductive approach with a descriptive design was used. Eleven faculty members (3 men and 8 women, median age 51) who served as course leaders in doctoral courses during the pandemic were interviewed. The interviews were recorded, transcribed and analyzed according to reflexive thematic analysis.

**Results:** The analysis generated four themes, *Facilitating student learning through flexibility and time for reflection*, *Using social interaction as a catalyst for learning*, *Enabling student interaction through a safe and structured online environment*, and *Engaging in digital tools to create variation and engagement*.

**Conclusion:** Our results suggest that the shift to online education during the pandemic accelerated the development of online doctoral courses, driven by adjustments prioritizing social interaction, self-directed learning, and digital tools. However, challenges such as increased cognitive demands and the added effort required by faculty to foster engagement were also identified.

## KEYWORDS

online learning, doctoral education, COVID-19, higher education, qualitative research

# 1 Introduction

During the COVID-19 pandemic many universities needed to rapidly shift from campus-based to online education (Bryson and Andres, 2020; United Nations, 2020; Singh and Thurman, 2019). The digital shift continues beyond the pandemic, creating ongoing demands for both faculty and students in terms of digital literacies and competencies (Leask, 2020; Ní Shé et al., 2019). As pedagogical practices evolve, students have developed new expectations on the learning environment, such as flexible learning opportunities and informal spaces for social interactions (Valtonen et al., 2021). One of the primary challenges of online education is enhancing active student engagement (Bryson and Andres, 2020).

In a review of active student engagement, Bond et al. (2020) identified a lack of clear definition of this concept. Active student engagement can be seen as an umbrella term that includes various roles, such as students supporting, empowering, and challenging each other's learning, reflecting on their learning, applying new knowledge in meaningful ways, co-creating teaching materials, providing feedback to instructors, and mentoring peers (Barrineau et al., 2019; Bovill et al., 2016). These roles represent a shift from students as passive recipients of knowledge to active participants in both their own and others' learning. Additionally, online education is defined in this work as education delivered via the internet for teaching and learning (Singh and Thurman, 2019).

Active student engagement can align with social constructivism, through a shared view that learning happens in a social interactive process of collaborating with others in a given environment. Constructivism views learning as an active process where students construct knowledge based on their prior experiences (Watson, 2001; Vygotsky, 1978). Active learning methods put this into practice by encouraging students to engage directly with content, reflect on their learning, and apply new knowledge meaningfully (Biggs and Tang, 2007). Active student engagement will in this paper be aligned in practice more to social than cognitive constructivist theories in educational settings (Bond et al., 2020; Watson, 2001; Biggs and Tang, 2007).

Active student engagement is central to various frameworks for online education (Cleveland-Innes and Wilton, 2018; Watwood et al., 2009; Castro and Tumibay, 2021). Watwood et al. (2009) argue that online education success relies on teachers' social presence, students forming a learning community, and active student engagement. Castro et al. further emphasize that online education requires students to possess high digital literacy, self-sufficiency, and responsibility for their learning (Castro and Tumibay, 2021). Moreover, active student engagement in online education can align with the heutagogical, self-determined approach to learning, where learners are considered capable of constructing their knowledge and skills using for example digital technologies to empower both collaboration with others and independent work and thereby create their own learning experiences (Bărbuceanu, 2024). The heutagogical approach gives students autonomy not only in what they learn but also in how they learn, fostering self-regulated and lifelong learning skills.

Although, learning engagement can be lower in online education compared to traditional, campus-based settings (Panigrahi et al., 2018), a systematic review by Naciri et al. (2021) found that health professions students had positive perceptions, motivation, and engagement during the COVID-19 pandemic. De

Caro-Barek et al. (2023) found that postgraduate students believe successful online learning requires a balance between technology and human interaction. While technology enhances collaboration, flexibility, and accessibility, students emphasized the vital role of social presence and face-to-face connections in fostering active engagement. Vermeulen and Volman (2024) identified key factors that enhance engagement among postgraduate students: behavioral engagement, fostered by activities that improve attention, effort, and adaptability; affective engagement, strengthened through group cohesion, interaction, and trust; and cognitive engagement, enriched by discussions and personalized learning experiences.

A study on faculty strategies in postgraduate online courses found that teachers often rely on lectures and content discussions, regardless of teaching modality or learner-centered beliefs. While lecturing is traditionally seen as less learner-centered, it can still promote deeper engagement (Shi et al., 2023). One qualitative study found that undergraduate health science university teachers felt a loss of teacher identity, due the absence of classroom dynamics, lack of non-verbal student feedback, and challenges in adapting teaching to students' needs (Christensen et al., 2022). Sytnik and Stopochkin (2023) argue that the effectiveness of active learning strategies depends on faculty choosing methods that align with student characteristics, such as self-reliance and engagement, which can significantly influence learning outcomes.

To the best of our knowledge, no studies have explored how faculty members in doctoral courses experienced active student engagement while transitioning from campus-based to online learning during the pandemic. The EUA Council for Doctoral Education (2022) emphasizes that doctoral students must acquire modern research competencies, including transversal skills like interdisciplinary thinking and the ability to communicate their capabilities effectively. Peer learning and interaction are key to developing these skills, as noted by Nerad (2012). However, the social distancing measures of the pandemic further intensified the already substantial isolation experienced by doctoral students. Given the demanding nature of doctoral education, which requires skills best supported through active student engagement (EUA Council for Doctoral Education, Nerad, 2012), and the high motivation and self-reliance often demonstrated by doctoral students, findings from undergraduate or graduate education may not fully apply to the doctoral context. This study aimed to explore faculty members' experiences in promoting active student engagement in online doctoral courses during the COVID-19 pandemic, with a focus on understanding how they navigated the challenges of this transition, particularly in fostering active student engagement.

## 2 Materials and methods

### 2.1 Study design

A qualitative interview design was used to explore faculty members' experiences of active student engagement in online doctoral courses (Braun and Clarke, 2019; Braun and Clarke, 2023). The study is reported in accordance with the Standards for Reporting Qualitative Research (SRQR) (Supplementary Table S1) (O'Brien et al., 2014).

## 2.2 Setting and participants

The participants were selected from course leaders of doctoral courses in healthcare sciences, medicine, and public health/epidemiology offered at a medical university in Sweden, during the COVID-19 pandemic. Purposive sampling ensured representation across gender, varying levels of pedagogical training, and diverse teaching experiences (Campbell et al., 2020). By purposively selecting male and female faculty with diverse pedagogical training and teaching experience, we aimed to capture a broad range of perspectives. Research suggests that less senior faculty members endure greater emotional labor when engaging with students than their senior colleagues. Moreover, women in academia often face reduced autonomy and heightened pressure due to traditional gender roles, underscoring the importance of inclusive representation (Tunguz, 2016). Invitations were sent via email and when a potential participant declined, another individual with similar characteristics (in terms of gender and teaching experience) was invited. A total of 20 individuals were invited, of whom 11 (eight women and three men) accepted and participated in the study. Nine declined or did not respond: two cited time constraints, five felt they lacked sufficient experience teaching doctoral courses during the pandemic, and two did not provide a reason.

The median age of the 11 participants was 51 years (range 36–58). They had a median of 7 weeks of full-time formal pedagogical training for university educators, with courses designed in line with Swedish national recommendations (range from 5 to over 20 weeks) and a median of 6.6 years of experience teaching doctoral education (range 3 to over 20 years). All participants had served as both course leaders and teachers of doctoral courses during the pandemic.

## 2.3 Ethical considerations

All participants provided written informed consent before the interview, and the study was performed in accordance with the Declaration of Helsinki. An ethical application was submitted to the Swedish Ethical Review Authority, who determined that the current study did not require approval since no intervention would be made and no processing of sensitive data would take place (Dnr 2022-02396-01).

## 2.4 Data collection

Data were collected through semi-structured interviews conducted between September 2022 and May 2023 by the first author (AKW) via the M365 Teams platform. The interviews lasted a median of 36 min, ranging from 23 to 51 min. An interview guide was developed by three authors (AKW, EA, and ES) (Table 1). The guide was designed to align with the study's objective of exploring faculty members' experiences in promoting active student engagement in online doctoral courses. To facilitate rich, reflective responses, the guide consisted of open-ended questions accompanied by tailored follow-up prompts. For example, one question asked, "Can you tell me about what active student participation means to you?" (see Table 1). The follow-up prompts were designed to encourage faculty members to elaborate on their experiences in greater detail. These prompts were

TABLE 1 Semi-structured interview guide.

1. Describe the online teaching in your doctoral course during the COVID-19 pandemic
2. Can you tell me about what active student participation means to you? Can you share your thoughts/reflections on it regarding doctoral education?
3. Describe a typical situation in your teaching during the COVID-19 pandemic where active student participation was evident
4. What student-activating pedagogical strategies have you used in your teaching during the COVID-19 pandemic?
5. Can you describe a situation in your teaching during the COVID-19 pandemic where students have been involved in co-creating an educational moment or contributing to creating learning materials? What went well/what did not go well?
6. Tell us about a situation in your teaching during the COVID-19 pandemic when students' views have led to a change in teaching or learning materials? What went well/what did not go well?
7. Describe a situation in your teaching during the COVID-19 pandemic when students acted as teachers or mentors to other students
8. Describe a situation in your teaching during the COVID-19 pandemic when students had to challenge each other's learning. What went well/what did not go well?
9. Describe what changes you have made in your teaching/your pedagogical methods regarding online teaching compared to campus teaching during the COVID-19 pandemic
10. Tell us how you used synchronous and asynchronous learning activities to activate students in your teaching during the COVID-19 pandemic
11. What do you define as digital tools?
12. What digital tools did you use in your teaching during the COVID-19 pandemic? Describe in what ways these tools helped activating students
13. How have you used Zoom, Canvas, Kahoot, Padlet, Facebook, WhatsApp in your teaching during the COVID-19 pandemic?
14. How did you facilitate social engagement in the digital environment in your course(s) during the COVID-19 pandemic?
15. Tell us about a situation in your teaching during the COVID-19 pandemic when you have learned something about how to challenge students to take an active role in their own and others' learning
16. If you were to design an online doctoral course now after the COVID-19 pandemic, what would you do to engage students and get them to challenge each other's learning?
17. What could complicate the proposal you just gave?
18. What could facilitate your proposal?
19. Based on your experience of online teaching during the COVID-19 pandemic, what have you learned about how to challenge students to take an active role in their own and others' learning?

adjusted as needed, depending on individual participants' responses, allowing for a more nuanced understanding of their perspectives. All interviews were audio recorded, transcribed verbatim, and data collection concluded after 11 interviews.

## 2.5 Data analysis

A qualitative reflexive thematic analysis with an inductive approach was conducted using the following six phases: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report

(Table 2) (Braun and Clarke, 2019; Braun and Clarke, 2023). The research team comprised three female physiotherapists (AKW, NB, ES) and one male occupational therapist (EA), all experienced in qualitative research. Additionally, EA and ES had extensive expertise in various qualitative approaches. All team members had formal pedagogical training and experience in teaching at undergraduate and advanced levels in healthcare education. AKW and EA also had experience teaching doctoral courses in healthcare sciences and/or public health/epidemiology at the university where the study was conducted.

## 3 Results

The analysis resulted in four themes that describe faculty members experience of promoting active student engagement in online doctoral courses during the COVID-19 pandemic, *Facilitating student learning through flexibility and time for reflection*, *Using social interaction as a catalyst for learning*, *Enabling student interaction through a safe and structured online environment*, and *Engaging in digital tools to create variation and engagement*.

### 3.1 Facilitating student learning through flexibility and time for reflection

The participants described that the transition from campus-based to online education required careful consideration of the activities that worked well and those that did not. Although some doctoral courses prior to the pandemic included a mix of online and in-person instruction, the pandemic forced faculty members to abruptly transition to fully online education. Many students were unprepared for this sudden shift, requiring faculty members to adopt a flexible approach. For instance, students with poor Wi-Fi connectivity could

opt to record a video or write reflections instead of participating in live online discussions. The online learning activities were continuously developed in collaboration with students.

*"But then it became that everything was very urgent and just happened. Someone had to drop out and someone went through with it, but it was a bit drawn out. There was a lot about that, that you had to be very flexible, I think, and try to enable them."* (Interview 7)

According to the participants, students who received information about the prerequisites were better at adapting to online education. They also emphasized the importance of shorter lectures and more time for pauses and discussions in online education. They believed that it was crucial to provide ample time for everyone to express their opinions and reflect. *"But maybe that's something you often forget that they might need more time for breakout rooms if they are given an assignment that they are also supposed to present together, to have a little more space."* (Interview 3).

### 3.2 Using social interaction as a catalyst for learning

According to the participants, a challenge of online education is that students may be more hesitant to participate behind a screen than in a classroom, and that it is more difficult to perceive nonverbal cues in an online environment. The participants also expressed that online education does not promote social interaction. They stressed that interactions and discussions are not initiated spontaneously, as compared to campus-based education where students more naturally meet and talk to each other. They expressed that having the camera on during online communication was considered a key issue in promoting interaction. *"It's much harder to be interactive over Zoom which has to do with what you perceive in this communication. So, if you are in the classroom then it's easy... you see everyone in a different way, you just have to turn your head a bit."* (Interview 4).

The participants highlighted the teacher's central role as a moderator and facilitator, fostering interactions among students. They emphasized the importance of the teacher stepping back and assuming the role of a guide on the side, empowering students to take responsibility for their own learning and that of their peers. *"I think when they present these concepts to each other, it's like they have to own the concept, because the others have not read the same articles. Then they have to be able to answer the others' questions and also explain their own interpretation."* (Interview 5).

According to the participants, students created knowledge and generated new ideas through group discussions, presentations, peer-feedback, and shared learning experiences. The students learned from each other by sharing their own examples and questioning each other's assumptions. The participants emphasized the importance of students getting to know each other and finding common interests to maintain a constructive dialogue. This could be achieved by spending informal time together online and using social exercises at the beginning of a course. *"Because I think there is a very interesting contagious dynamic among the students, whereby there may be people who speak more, people who speak less, but as soon as there is someone who starts speaking, the others follow."* (Interview 1).

TABLE 2 The steps in the data analysis.

- To familiarize and get an overview of the material, all of the transcribed individual interviews were first read carefully by the first author (AKW)
- Next, open coding was performed through exploring and marking relevant features (meaning units) in the text describing active student engagement in online doctoral courses, while reading it. Notes and short descriptive words (codes) were written in the margins to give meaning to the selected features. The material was read through several times while codes and meaning units were selected. The codes were then moved/collected from the margins on to a coding sheet. Open coding was made with all the material by the first author (AKW), and with three of the interviews by the last author (ES)
- The various codes were compared regarding differences and similarities. Data relevant to each code were sorted systematically to create a sense of pattern and then organized into themes
- The themes were generated through a reflexive dialog between the first and last authors (AKW, ES). They engaged in repeated discussions, analyzing the content of the original interviews. Additionally, continuous discussions were held with another co-author used as peer expert (EA)
- The last step of the analysis included defining and naming the final themes as well as providing quotes for illustration and trustworthiness of the result
- The analytical process included a reflexive dialogue with the whole research team, which involved revision and refining the naming of themes



The participants described using breakout groups for discussions during online lectures and group work. Most participants reported that dividing the course into smaller groups was most effective for online education. Some participants tried to increase variation and social interaction through varying group size and composition, such as putting students from different disciplines in the same group. “...the size of the group is crucial when it is online. You cannot have too big a group, because it’s too difficult to keep track of everyone.” (Interview 2).

### 3.3 Enabling student interaction through a safe and structured online environment

The participants emphasized the importance of creating a safe and permissive online learning environment that facilitated a constructive dialogue. They described the importance of getting students to feel a sense of belonging. Being a present and non-judgmental teacher who promoted a safe and permissive online environment was mentioned as an important aspect of this. Some participants mentioned the importance of playfulness as well as the online interface to create a sense of being in a classroom. “Trying to create an environment that is permissive and creative where you can fail. So, we put a lot of emphasis on creating that atmosphere in the first days.” (Interview 7).

The participants emphasized the importance of clear structure and guidelines to create a safe learning environment. They described that preparations such as reading or watching a film before a live session were important for the students’ confidence to talk during the live session. Preparations were considered more important for online education than campus-based education. “I think, if they are motivated to learn, then they prepare. And then they get more confident into asking questions, for instance.” (Interview 9).

### 3.4 Engaging in digital tools to create variation and engagement

According to the participants, online education enabled the possibility of doing things simultaneously such as writing messages and editing a lecture during the lecture and moving between breakout rooms. They noted that online education allowed them to offer a greater variety of learning activities to engage the students, surpassing what was possible in campus-based settings. “In the digital learning room, I can jump between the digital breakout rooms and listen to what they say. At the same time, I can ask them to maybe write something in Padlet and put it up on the PowerPoint immediately afterwards when we gather. So, I actually feel that when it comes to those parts, I have more control in the digital learning environment than in the physical learning environment actually.” (Interview 6).

They stressed the importance of using technical tools to create variation and interaction in online education. The digital tools mentioned by the participants were Zoom, Canvas, Google documents, Padlet, Mentimeter, Socrative, Kahoot, Gather Town, and films, as well as built-in features in some of these tools such as breakout groups, chats, and digital whiteboards. Some participants emphasized that the pandemic accelerated the advancement of online doctoral education. “From the beginning ... because it wasn’t that ... I had had online seminars long before the pandemic, but then it was

more basic—you just talked, and some people listened. So, it has developed all the time.” (Interview 10).

Some participants, however, experienced a reduced student engagement during the pandemic. They described a constant struggle, competing against students’ thoughts, schedules, and expectations. Specifically, those students working in healthcare often had challenges in prioritizing their studies. “...you are constantly competing against the students’ own thoughts in some way. You have to be more interesting; you have to make them do more things that make them drop this other thing that makes them not be present.” (Interview 6).

## 4 Discussion

This study explored faculty member’s experiences in promoting active student engagement in online doctoral courses during the COVID-19 pandemic. Four themes emerged: *Facilitating student learning through flexibility and time for reflection*, *Using social interaction as a catalyst for learning*, *Enabling student interaction through a safe and structured online environment*, and *Engaging in digital tools to create variation and engagement*. These themes illuminate the challenges faculty faced and the opportunities they embraced to enhance active student engagement in online doctoral education during the pandemic.

The participants described that they *facilitated student learning through flexibility and time for reflection*. A pre-pandemic study by [Valtonen et al. \(2021\)](#) on Finnish university students found that students valued having input on how learning was structured, including assessment methods and course activities. This suggests that the increased flexibility in learning activities during the pandemic likely contributed to students’ engagement and learning outcomes, particularly compared to traditional campus-based education.

Our findings highlight the value of shorter lectures and more time for pauses, discussions, and reflections in online education compared to campus-based settings. These results align with [Desai et al. \(2009\)](#) research, which suggest that online education is more tiring than classroom-based learning due to the increased cognitive demands of processing cues such as facial expressions and voice tone and pitch. These demands may also explain why participants preferred dividing the course into smaller groups for online education, which allowed for more manageable engagement and deeper peer interactions.

Our results highlight that the use of *social interaction acts as a catalyst for learning*. This finding aligns with constructivism, which emphasizes the role of collaborative dialog in promoting learning ([Watson, 2001](#); [Biggs and Tang, 2007](#)). The participants stressed their central role in fostering interactions and empowering students to take responsibility for their own learning and that of their peers. In the context of online education, previous research indicates that teachers should take on the role of facilitators rather than simply conveying information ([Boling et al., 2012](#)). This perspective is particularly crucial in doctoral education, where the focus extends beyond subject-specific knowledge to encompass skills such as critical thinking, analysis, synthesis, interdisciplinary thinking, and effective communication ([EUA Council for Doctoral Education, 2022](#); [Nerad, 2012](#)).

The participants stressed the importance of *enabling student interaction through a safe and structured online environment*. This focus is consistent with previous research, which indicate that

well-organized course structures, clear goals, and transparent methods help foster a sense of community and promote active student engagement (Brindley et al., 2009). In the context of online education, these elements are especially crucial for enhancing active student engagement and improving learning outcomes. Additionally, effective student preparation enables more time for engaging in higher-order problem-solving activities (Chen et al., 2017), which was also suggested by our findings. Participants also underscored the critical role of fostering a sense of belonging, which they identified as essential for encouraging student interaction. This perspective aligns with Gourlay et al. (2021) whose study on postgraduate students during the COVID-19 pandemic revealed that online engagement is multifaceted, with a sense of belonging being central for active student engagement.

The participants expressed that they *engaged in digital tools to create variation and engagement in learning activities*. This supports the principle of using multimodal, technology-driven learning environments to enhance active student engagement, a core element of heutagogical approaches (Bărbuceanu, 2024). Heutagogy, as a self-determined learning theory, is particularly well-suited for doctoral education, which prioritizes critical thinking, autonomy, and self-directed learning. Our findings indicate that faculty who embrace this model, by incorporating strategies such as flexible learning environments, clear goals and guidelines, and diverse materials along with student interaction, may be able to support active student engagement and critical thinking.

However, the transition to a heutagogical approach is not without challenges. Faculty members, especially those accustomed to traditional lecture-based methods, may face difficulties to integrate socially constructed and situated knowledge in a course if there are competing positivist and cognitive paradigms that imbue a program curriculum. Additionally, fostering heutagogy might require time and a high level of digital literacy from both faculty and students. Digital literacy, which includes the skills needed to effectively use digital tools for learning and interaction, is crucial for academic success (Tinmaz et al., 2022). Faculty should prioritize enhancing digital literacy through clear instructions and ongoing support (Holm, 2024; Dowling and Wilson, 2015).

Maintaining high quality online education relies not only on digital literacy, but also on the willingness of students and faculty to embrace new tools. A qualitative study with Australian doctoral students found that they were more likely to adopt digital tools when they perceived them as helping to complete their doctoral studies on time (Dowling and Wilson, 2015). Furthermore, the participants in the current study emphasized that online education does not inherently promote active engagement. Consequently, faculty must invest extra time and effort to foster active student engagement, which can lead to increased stress and negatively impact their working environment.

Some strengths and limitations of this study must be acknowledged. There has been much debate about the use of terms traditionally associated with a positivistic filter of quality criteria uncritically applied onto qualitative research (Braun and Clarke, 2024). In keeping with arguments within thematic analysis, we will raise some strengths and limitations based on our process. The analytic process was strengthened by an open coding process in which authors ES and AKW engaged in an ongoing reflexive dialogue about emerging results, which was also shared with the whole research team. The research team comprised

experienced researchers with formal pedagogical training and qualitative research expertise. The interviewer's collegial relationship with some participants may have influenced the results. While it may have encouraged openness, it could also have introduced biases, such as social desirability or assumptions, which might affect interpretation of the findings. However, the reflexive dialogue that occurred throughout the study with co-authors, acknowledging personal preconceptions, supported rigor and served to strengthen trustworthiness (Braun and Clarke, 2019; Braun and Clarke, 2023).

We involved multiple researchers in the data analysis process to maintain a reflexive dialogue throughout the study. This helped to enhance the richness of our findings. Although not critical, there was an attempt made to invite participants that would be able to speak to different experiences and perspectives. Participants thus represented diversity in gender, pedagogical training, and teaching experience (Campbell et al., 2020). We contend that while the concepts of data saturation, thematic saturation, and code saturation align with the neo-positivist, discovery-oriented approach inherent in coding reliability types of thematic analysis, they do not align with the values and assumptions of reflective thematic analysis (Braun and Clarke, 2021). Although participants were recruited from a single university and the sample size was relatively small, detailed descriptions of the study context and participant characteristics are provided to enable readers to understand how our findings can be relevant in other contexts. The findings offer insights into faculty experiences with active student engagement in online doctoral courses during the COVID-19 pandemic, particularly at medical universities with similar contexts and faculty backgrounds. Future research could expand on these insights by exploring both student and faculty experiences with active engagement in online doctoral courses across different academic disciplines. Additionally, investigating strategies to support faculty in maintaining active student engagement while safeguarding their mental well-being would be an important area for further study.

In conclusion, our findings indicate that the rapid shift from campus-based to online education during the pandemic played a significant role in accelerating the advancement of online doctoral education. This acceleration was primarily driven by pedagogical adjustments, including a stronger emphasis on fostering social interactions, promoting self-directed learning, and utilizing diverse digital tools. While these adjustments offered opportunities for active student engagement, we also identified several challenges, such as increased cognitive demands and the additional effort and time required by faculty to facilitate active student engagement. Moving forward, it is essential to design and implement courses that balance these opportunities with the challenges faculty face, ensuring adequate support and resources to sustain active student engagement and faculty well-being.

## Data availability statement

The data analyzed in this study contains pseudonymized personal data from 11 human participants. Due to the small sample size and the associated risk of re-identification, the data cannot be shared openly in compliance with GDPR, Swedish ethical regulations, and

the participants' informed consent. Access to the data may be granted upon reasonable request. Please contact the Research Data Office at Karolinska Institutet ([rdo@ki.se](mailto:rdo@ki.se)) for further information and to initiate the request process.

## Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

A-KW: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing. EA: Conceptualization, Methodology, Validation, Writing – review & editing. NB: Methodology, Writing – review & editing. ES: Conceptualization, Methodology, Validation, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

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## Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2025.1557379/full#supplementary-material>

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