Creating conditions for active participation and collaborative learning through digital learning tools

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Introduction

Despite the longstanding consensus that active learning results in higher-order learning (Bonwell & Eison, 1991; Prince, 2004; Freeman et al., 2014) I consistently observe the same pattern across courses: a small group of consistently active students, a larger group of occasionally active students, and some who remain silent throughout. Barriers to active participation include psychologically unsafe learning environments (Edmondson, 1999), individualized performance cultures that discourage risk-taking (Ames, 1992), and teaching formats that fail to accommodate diverse preferences, personalities, and learning needs (Tang et al., 2022).

Digital learning tools can lower barriers to active participation and foster collaborative learning (Bond et al., 2020, 2020). Features such as optional anonymity may increase psychological safety for students who are reluctant to speak in plenary settings, while tools like digital boards or shared online notebooks allow contributions at an individual pace and support extended thinking time. Because these workspaces remain accessible outside scheduled teaching hours, they extend opportunities for peer support, enabling students to comment on each other's work, share resources, and continue discussions asynchronously (Bond et al., 2020). Making notes and materials collectively available may reduce the pressure to take extensive notes during class and help shift the learning environment from individual competition toward collaboration (Costley & Fanguy, 2021; Johnson et al., 2014). Moreover, co-creation and collaborative learning mirror the realities of contemporary labor markets,

where goals are rarely achieved through isolated individual performance. Digital learning spaces that support joint problem-solving, shared drafting, and iterative peer feedback help students practice the communicative, coordinative, and co-productive competencies demanded across professional domains.

Active participation fosters collaborative learning because it externalizes students' thinking and makes their reasoning visible (Johnson et al., 2014). Visible contributions, whether questions, ideas, examples, critiques, or non-verbal signals, enable peer feedback and collective problem-solving. They also give teachers insight into students' understanding, which allows for timely instructional support. This temporary, adaptive guidance is also described as 'scaffolding' (Wood et al., 1976). I use the term active participation to denote any form of visible contribution whether oral, written, or non-verbal, in plenary discussions, small groups, or one-to-one exchanges.

The dynamic process of active participation and collaborative learning aligns closely with Vygotsky's view of learning as a developmental process in which individuals grow by engaging with more knowledgeable others (e.g. teacher or peers) and participating in shared meaning-making (Vygotskij, 1978). Later work has extended this sociocultural perspective to digital environments, showing how digital tools can support collaboration and scaffold learning (Warschauer, 1997). Fig. 1 illustrates how digital learning tools can influence psychological safety and increase active participation and collaborative learning. Through appropriate scaffolding, students may be kept in the zone of proximal development where they participate actively and interact with more knowledgeable others (peers or teacher) to learn.

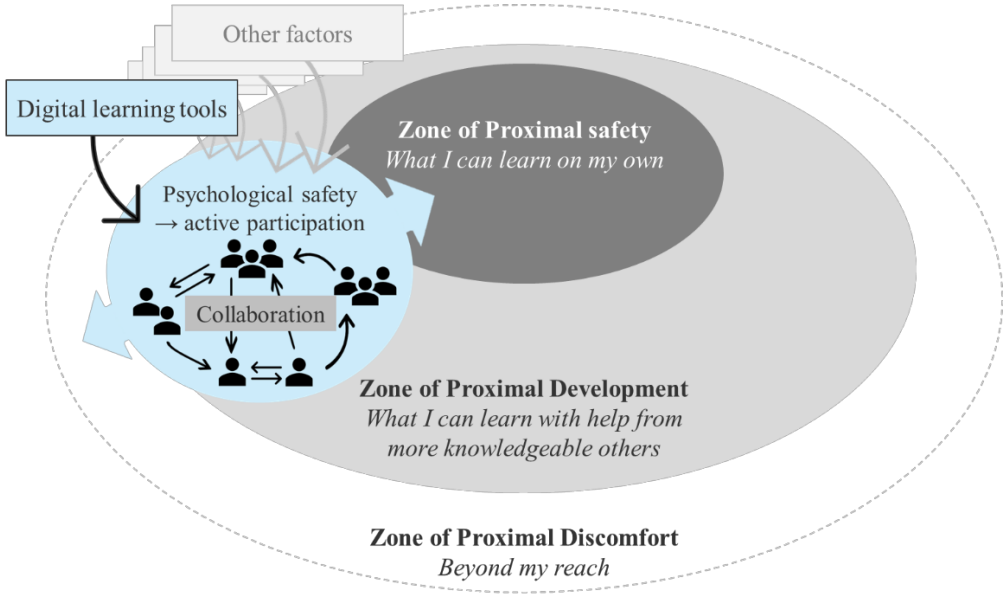


Fig. 1. Conceptual model of how digital learning tools affect psychological safety and collaborative learning while students may move between zones of proximal safety, development, and discomfort. The figure is adapted from Saul McLeod 2025 and Steve Wheeler 2013.

Although Vygotsky originally focused on child development, the underlying principles are also relevant to students entering higher education. Beginning university is not only an academic transition but also a development of a new academic and professional identity (Christiaens et al., 2021). Digital learning tools can increase social interdependence and facilitate collaborative learning (Bond et al., 2020; Johnson et al., 2014), and the negotiation of meaning and a sense of belonging within social communities play central roles in shaping personal identity (Wenger, 2008).

To support the emergence of a collaborative learning environment, I introduced digital learning tools to enhance psychological safety and strengthen active participation among first-year public health students. In the following, I reflect on how digital learning tools supported active participation and collaborative learning when viewed through Vygotsky's sociocultural lens.

Context

In the fall of 2024, I was appointed course leader for Epidemiology 1 (SFOB20004U) which is a mandatory methodologic course in the first block of the first semester in the Bachelor of Science in Public Health program alongside three other mandatory courses. Briefly, Epidemiology 1 runs for five weeks with each module including one 'lecture' and two hours of 'class teaching' with exercises each week. The course introduces the most common epidemiologic designs, thereby laying a foundation for Epidemiology 2 in the second semester. The intended learning outcomes of Epidemiology 1 can be found in Appendix 1.

The curriculum includes a textbook (also used in 'Epidemiology 2'), scientific papers, exercises, videos, etc., and the teaching format is structured as flipped learning. As preparation for each module, students are expected to watch two videos interrupted by a short quiz. Before the exercise lessons, students are asked to read a scientific paper.

Each module begins with an in-person lecture that starts with a recap of the previous week's topic and how it relates to this week's topic. Continuing with a recent relevant example of a study that made it to the media, I explain why it is a good or a problematic example of the study design in focus. After this follows 2-3 discussion slides where I present the students to questions to be discussed in pairs or small peer groups. Each question is followed up in plenum where students share their perspectives. In the following exercise lessons, students work with questions for the scientific paper, also in small groups, and we follow up in plenary after every 2-3 questions. During the group work, I visit the groups to answer questions, guide, and discuss.

The course is completed with an exam evaluated without grading as passed/not passed (which goes for all courses in the first semester) based on a six-hour written examination at home with all aids. Students are given access to a scientific paper 24 hours in advance, and the exam consists of questions related to the specific paper but requires the inclusion of other parts of the curriculum.

The students in Epidemiology 1 represents a relatively homogeneous group. Although the course is open for credit-transfer student and cross-registered student, all seats are usually occupied by the program students. The grade entry requirement is high (9.4 in 2024, https://studier.ku.dk/bachelor/folkesundhedsvidenskab/) with 90%/10% uptake via quota 1 and 2, respectively. Most students recently completed their secondary education and did not study at university level before. Thus, they have been used to the more structured format with attendance requirements, more extensive individual assessment (e.g., with individual annual grades for oral class performance), and specific reading requirements at their secondary educational programs. They are usually highly motivated, ambitious, and engaged.

Methods

From the outset, I explicitly shared my intentions and reasoning behind the different elements of my teaching with the students because I wanted to model the transparency, approachability, and psychological safety I hoped to cultivate in the classroom.

Throughout the five course modules, I tested three types of digital learning tools or formats to generate active participation and collaboration. The first category included asking students to scan a QR code to enter an online poll and either vote for the correct answer(s) or provide free text response to a question or a case. The aim was to increase psychological safety by offering an anonymous way of contributing their response without having to speak up in plenum. The second category involved asking students to think-pair-share or group-discuss-share, before contributing their main points via a link to a digital board. This opportunity would allow students to test their view in a small-scale setting before sharing them and lower the barrier for elaborating on it in plenum. Third, and finally, I introduce a Padlet (www.padlet.com) divided into five modules (one for each course module) for collaborative keywords, notes, questions, and comments across the course. The students may choose to contribute anonymously or with name as they preferred. The aim was that students used it dynamically during class and at any other time when relevant, and I planned to visit frequently to assist with

clarification, validation, or directions for further reading. This would also help me evaluate their understanding and provide appropriate scaffolding.

After completion of the course but before the exam, I scheduled a Q&A session. I asked the students to enter their questions into the main course Padlet in advance so that I could prepare answers carefully. The course would additionally be evaluated at a meeting with the study board after the exam.

Results

I opened the Epidemiology 1 course room two weeks before the first module and posted a short video introducing the course, myself, and the practicalities. The introduction was followed up with a short 10-minute presentation of the course as part of the general onboarding for first-year public health students. In the first module, I continued this approach by explaining the reasoning behind the flipped-learning format and sharing my didactical mission of creating a safe collaborative learning environment where active participation was welcomed and expected.

Sixty-five students enrolled in the Epidemiology 1 course and generally, most of them showed up for the scheduled lessons which is crucial for activity and collaboration. As an introduction to the first module, I shared my mission to strengthen collaborative learning with the students and I explained the role of the pedagogy supervisor who was present. I invited them to contribute actively throughout the course, gave examples on how active participation benefits learning and explained why.

Especially at the beginning of the course, the students were very active. Digital tools using closed-ended questions and anonymity generated high levels of activity, particularly early in the course where I generally received answers from everyone. I followed-up with a plenary discussion offering a chance to elaborate, question, and discuss, and I elaborated, explained, or validated the contributions when needed, and I often had to close discussions in the interest of time because of the high level of activity. In the later modules of the course, I increased my use of more open-ended questions requiring free text responses to fade my role as teacher and let the students gradually rely more on each other. With

this, I observed declining activity when using digital learning tools, even though the overall participation remained stable.

The Padlet became my most central tool going across all modules of the course. I came up with this idea after the first module and therefore introduced it in the second module. Despite strong encouragement to ask questions, collaborate, being generous with sharing notes and knowledge, and commenting on each other's posts, there was overall little activity. In attempts to spark activity, I tried to: 1) ask the students to post their answers during the class session, 2) divide the class in two and had them work with different problems and share their results, and 3) use the Padlet for the elective Q&A session concluding the course prior to the exam. For the Q&A session, I received 14 questions in advance of the Q&A session and 34/65 students showed up.

During the mandatory evaluation of the course, I asked the students how they thought about the possibility of posting questions and collaborate in the Padlet. The general expressed opinion was one of satisfaction, but some students mentioned that they preferred their personal notes and my opinion rather than their peers'. At the subsequent evaluation with the study board, the student representatives expressed satisfaction with the course in general and with the structure and flipped learning format in particular.

Discussion

To support the emergence of a collaborative learning environment, I introduced three types of digital learning tools to enhance psychological safety and strengthen active participation among first-year public health students. The most anonymous, closed-ended digital tools generated immediate visible activity and lively plenary discussions, although this engagement tapered slightly off as the course progressed. In contrast, the Padlet for shared notes remained largely unused except from a short peak in posts before the Q&A session at the end of the course.

Viewed through a Vygotskyan lens, two overarching explanations emerge: 1) low perceived social risk appears to be a prerequisite for active participation, and 2) the Padlet likely lacked sufficient scaffolding and peer legitimacy to function as a sustainable space for collaborative

learning. In Vygotskian terms, the Padlet did not seem to provide sufficient scaffolding for students to work within their zone of proximal development because (a) peers were not yet perceived as legitimate more knowledgeable others, and (b) the activity lacked repeated, explicit modelling and gradual fading of teacher support.

The high early engagement with anonymous digital tools may reflect the importance of psychological safety in participation at the beginning of this course. Closed-ended questions with anonymous voting allow students to 'hide in a category' rather than risk identification through written answers on screen. Seeing the distribution of answers provides validation or reassurance that others shared their understanding. This reduces fear of judgement and lowers the emotional risk associated with making thinking visible, thereby supporting early participation (Ames, 1992).

The limited engagement with the Padlet-based shared notes likely reflects a combination of factors. One possibility is that students' prior experiences in highly teacher-directed, performance-oriented learning environments continued to shape their behavior. Having been accustomed to individual assessment and competition, students may withhold their knowledge to benefit themselves. Constant evaluation (or the feeling of it) can discourage risk-taking and reduce willingness to contribute publicly (Ames, 1992). If the preference for personal notes over shared ones reflects these ingrained habits, my aim to support the emergence of a collaborative learning environment through digital learning tools did not succeed in shifting norms and culture towards collaborative learning.

At the same time, the design of the Padlet activity may have contributed to the low participation. Unlike the digital polls and questions (with or without prior sharing) the Padlet was more open-ended and optional. Without clear expectations, explicit modeling, or alignment with the final assessment, students may not have understood its purpose or perceived its value. The openness of the task may also have increased cognitive and social demands, placing the activity closer to the zone of proximal discomfort. In this sense, the challenge was not the digital learning tool itself, but rather insufficiently negotiated expectations at the outset. A more explicit establishment of the didactical contract, including

why the Padlet is central to the course and how students are expected to engage with it, will be essential in the future.

These dynamics unfolded within a cohort still in the process of forming shared norms and a sense of collective identity. First-year students navigate unfamiliar academic cultures and expectations which may be accompanied by uncertainty about their own competence (Stokoe et al., 2024). Without established norms of mutual support and shared inquiry, collaborative learning can remain unrealized (Johnson et al., 2014). First-year students in their first semester are likely in the process of establishing shared norms and cultures. This is a dynamic process of internalized and externalized negotiations (Eun, 2018) involving not only active participation in teaching sessions, but also individual backgrounds, and their expectations about starting university, which may be unrealistic or misaligned with reality (Tomlinson et al., 2023). The performance-oriented culture of upper secondary school may further inhibit active participation because peer-assisted collaborative learning tends not to take place in competitive environments (Johnson et al., 2014).

Active participation should provide visible insights into students' understanding, and with appropriate scaffolding, students could support one another's learning within their zones of proximal development. However, the results indicate that peers were not readily accepted as more knowledgeable others. Students continued to look primarily to me as the teacher for validation and clarification, and few built on each other's contributions in digital spaces. For peers to be acknowledged as legitimate sources of knowledge, students must perceive one another as trustworthy and competent. These conditions take time to establish and had not yet developed in this newly formed cohort.

Overall, the findings highlight the complexity of using digital tools in a sociocultural learning environment. Their effectiveness depends on the technology, pedagogy, social norms, and the broader learning culture (Bond et al., 2020). The digital learning tools used in this course supported some active participation, particularly early on, but they did not fully foster the collaborative learning envisioned.

A natural next step is to strengthen the scaffolding surrounding the Padlet-shared notes. Next time I teach Epidemiology 1, I plan to introduce the Padlet from the very beginning and model its use actively during

lessons. The modelling can involve pausing discussions and ask students to post notes, integrating Padlet-based Q&As into class time, and demonstrating how shared notes can support collective understanding. Such practices may help students see the value of the Padlet and take greater ownership of this collaborative space.

Conclusion

Digital learning tools can be useful for supporting active participation and collaborative learning, particularly in the early stages of a course. However, their effectiveness depends on the social and pedagogical context in which they are embedded. For first-year students navigating the transition into university learning, psychological safety, clear scaffolding, and explicit modelling of collaborative norms are essential. Importantly, peers may not be recognized as more knowledgeable others initially, underscoring the importance of teacher validation. Appropriate scaffolding and fading of the teacher alongside the use of digital learning tools may lower students' barriers for participating actively and foster collaborative learning.

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Appendices

Appendix 1: Intended learning outcomes for Epidemiology 1

The aim of the course is for students to be able to understand, reproduce, critically assess, and discuss the most important epidemiological designs. Upon completion of the course, students are expected to:

Knowledge:

- Be familiar with the characteristics of the most important epidemiological study designs
- Be familiar with the strengths/weaknesses of the most important epidemiological study designs

Skills:

- Be able to understand the characteristics and strengths/weaknesses of the most important epidemiological study designs
- Be able to describe the characteristics and strengths/weaknesses of the most important epidemiological study designs

Competencies:

- Be able to assess whether an epidemiological design is appropriate for illuminating a given problem
- Be able to discuss which epidemiological design(s) are appropriate for illuminating a given problem

From the course description: https://kurser.ku.dk/course/sfob20004u