Student engagement in shaping their learning environments: Boundary conditions and opportunities

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Abstract

Learning environments in higher education have received considerable political attention and have been approached through various perspectives in educational research. Yet, students are often positioned as participants or beneficiaries of learning environments rather than active creators. Building on a growing field of research on student engagement through active participation and co-creation, we explore how students navigate and engage with resources and boundaries when shaping learning environments. The empirical context for this study consists of two different cases of learning environments in which students play a crucial role: 1) student-initiated, teacher-supported elective courses and 2) an extracurricular student innovation centre. Data were gathered using focus group and individual interviews with university teachers and students. The thematic analysis provides insights into student engagement at three levels: 1) through participation in the activities happening in learning environments, 2) in shaping the material elements of the learning environments, and 3) in shaping the immaterial elements of the learning environments. Based on the analysis, this study illustrates how students and teachers, led by the same educational beliefs, can push the boundary conditions and co-create an opportunity space for different kinds of learning environments where students can play an active role in defining their education.

Keywords: agentic engagement; co-creation; learning environment; student-driven; student engagement

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Introduction

The term *learning environment* is widely used in the research literature to describe and conceptualise a variety of educational approaches, situations, and boundary conditions (Abualrub et al., 2013). Among other things, it is used to describe the

physical and material properties of classrooms and schools (Tessmer & Harris, 1992), concrete teaching approaches (Land et al., 2012), or social interactions in an educational setting (Schonert-Reichl, 2017). Furthermore, some argue more broadly that learning environments can be understood as contexts able to 'affect student achievement and attitudes' (Fraser, 1998, p. 3) and potentially increase the quality of learning (Bruno & Dell'Aversana, 2018).

Over the last few decades, the term learning environment has also gained significant political attention. International actors, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the European Association for Quality Assurance in Higher Education (ENQA), are inviting the creation of 'transformative'(UNESCO, 2020, p. 34), 'supportive' and 'effective' (ENQA, 2015, p. 15) learning environments. However, students often remain positioned as participants in and beneficiaries of learning environments rather than being recognised as central to the design of learning environments (Könings et al., 2014).

Simultaneously, research within the field of students-as-partners (SaP), with a focus on students' active involvement in creating and designing educational processes, has gained considerable interest (Bovill & Bulley, 2011). Under the SaP umbrella, the role of students in many university processes has been widely investigated, including learning, teaching and assessment, research, curriculum design, governance, and community development (Ashwin & McVitty, 2015; Bovill & Bulley, 2011; Healey et al., 2014; Klemencic, 2011). Despite considerable research interest in student–staff partnerships, examples of studies concerning *student-driven* educational activities are rather scarce (Holen et al., 2024).

With research concerning learning environments and SaP as a backdrop, the aim of this study is to explore how student engagement can play an important role in shaping learning environments. Focusing on two concrete cases, we address the following research question: *How do students navigate and engage with resources and boundaries when shaping learning environments?* To address this question, we build on a social constructivist perspective of learning and view learning environments as relational, dynamic, negotiated, and co-constructed. We provide an elaborate conceptual model of our understanding of the term learning environment in a later section. Using a qualitative analysis of focus group interviews and individual interviews with students and academics as a starting point, we delve into educational (and engagement) praxis in a sense of values- and traditions-based committed actions (Kemmis, 2010) in two contexts. Finally, we discuss different ways in which students can shape learning environments, their roles, and the resources and boundaries that students experience in this process.

Background

Learning environments

As outlined in the introduction, the term learning environment is widely used with various meanings and conceptualisations. Goh and Fraser (1998) trace the origins of the term to research in the 1930s, when it was acknowledged that the environment and the individual both play a role in determining behaviour and learning. Subsequent research was built on the assumption that objective learning environments exist and that they can be described and measured by variables that directly influence students' learning and outcomes (McRobbie & Tobin, 1997). In other words, much of the early research that used the term learning environment had a mechanistic understanding. More recently, around the 2000s, research on learning environments has become more nuanced and moved from a generic understanding of learning environments to focus on particular kinds of learning environments (e.g., structured by disciplines, see Ashwin, 2012). Abualrub et al. (2013) propose three different ways to understand learning environments: 1) as a pedagogical setting, 2) as a networking activity, and 3) as a university's responsibility. Furthermore, they argue that the most common understanding of a learning environment centres on the pedagogical setting of teaching and learning processes.

Additionally, starting around the 2000s, there has been an increasing interest in using design perspectives in learning environment research and development (Koçak & Soylu, 2023; Mäkelä et al., 2021). Participatory approaches to learning environment design have also been on the research agenda. Wang and Hannafin (2005), amongst others, have argued for design-based research as a method for learning environment design and simultaneously invite collaboration between researchers and practitioners. In participatory learning environment design (Könings et al., 2014), teachers' and students' perspectives are included in the learning environment design process. Yet the decision-making power remains in the hands of designers.

From a social constructivist perspective, these design perspectives are partially challenged, as learning environments are not seen as pre-designed and objective realities, but relational, dynamic, negotiated, and co-constructed (McRobbie & Tobin, 1997). With this perspective, every individual—student and teacher alike—shapes the learning environment in multiple ways through their actions and interactions. However, the process of shaping the learning environment is constrained by given boundary conditions. Notably, little research has investigated how students influence these boundary conditions and alter the opportunity space in which students and teachers shape learning environments.

Student engagement

The term *student engagement* describes students' active participation in activities within their learning environments and their emotional and physical investment in the learning processes that unfold within these environments. Fredricks et al. (2004) define student engagement along three dimensions: 1) behaviour (students' actions, e.g., putting effort into solving a task or following the rules), 2) emotion (students' affective dispositions, emotions, interests, and sense of belonging), and 3) cognition (psychological investments in learning and the mental efforts used to solve challenges).

Overall, student engagement has gained considerable interest in the research literature. However, several disagreements remain. While some consider it a broad "meta-construct" to describe interactions between students, educators, service staff, and institutions that enrich and improve tertiary experiences (Bowden et al., 2021, p. 1209), others claim that student engagement is poorly defined and weakly theorised (Kahn, 2014; Kahu, 2013). Furthermore, student engagement has been criticised for being purely performance oriented and manifesting neoliberal ideas of higher education (Zepke, 2015, 2018).

Reeve and Tseng (2011) suggest a possible response to this critique by proposing a fourth dimension in addition to behavioural, emotional, and cognitive engagement: *agentic engagement*. They define agentic engagement as 'students' constructive contribution into the flow of the instruction' (p. 258) and argue that agentic engagement is crucial for moving towards conceptualising teacher–student interactions as two-directional, rather than one-directional. Moving away from a one-directional understanding, or what Freire terms the *banking model of education* (1970), a two-directional understanding opens up the possibility to dissolve traditional teachers' and students' positions and view education as co-constructive (Wallin & Aarsand, 2019).

Similarly, Buckley (2018) argues for 'an alternative conception of student engagement, concerned not with students' active involvement in learning activities, but with their role in making decisions about learning and teaching; what is also known as "student voice"' (p. 716). By emphasising the participatory dimension and taking student voices seriously, this line of enquiry connects student engagement to the growing field of research regarding the SaP (Healey et al., 2014). SaP not only is grounded in a pedagogical idea but also builds on political rationales, including a wish for change through the process of co-creation and engagement (Bovill, 2019; Matthews & Dollinger, 2022). A central premise is that change in academia happens by sharing power with students (Matthews, 2017).

More radical forms of student engagement, such as students being *in control* (Bovill & Bulley, 2011) and taking *leadership* (Ashwin & McVitty, 2015) over

curriculum design or community building, are less researched and discussed. This kind of engagement has educational value for students in terms of developing leadership skills and self-insight, tackling complex and multidimensional problems, and gaining the habit of reflection (Singer-Brodowski & Bever, 2016; Zou et al., 2015). Yet, one tendency and major limitation that has been associated with this form of engagement is that it often unfolds in closed environments and has little impact at the institutional level (Ashwin & McVitty, 2015; Bovill & Bulley, 2011). In contrast, Dunne and Zandstra (2011) advocate the idea of students as *change agents* who can make a change in academia through involvement in educational and professional development. Carey (2018) further develops the idea of students as change agents concerning the institutional perspective and proposes the idea of a progressive university. In this kind of university, students can change their institutions and contribute to society beyond their universities' borders through engagement (Carey, 2018). In this way, student engagement as a praxis potentially enables students and teachers to question contemporary neoliberal higher education landscapes more fundamentally.

Conceptual model of learning environment and student engagement

Building on previous research, we propose, in the following, a conceptual model of our understanding of the term learning environment and its relation to student engagement (Figure 1).

The term learning environment links an activity with the context or environment in which learning takes place. The environment comprises material elements, such as physical space, objects, and people, as well as immaterial elements, such as cultural backgrounds, experiences and ideological and philosophical dispositions. The elements are static in one way but are constantly interpreted and given new meanings through the activities and processes in the environment. Moreover, the elements of the environment are deeply intertwined with the activities therein, shaping and influencing both social and human–object interactions. Importantly, this deep entanglement creates a complex situational relationship that cannot be reduced to simple causal relationships.

Building on a social constructivist perspective, everyone in a learning environment constantly shape—and are shaped by—the environment through their actions and social interactions. The different elements in a learning environment both enable and restrict. For example, properties of the physical space might impose certain restrictions on students' engagement and their interactions, or an authoritarian classroom culture might leave limited possibilities for students to

question and engage with activities. In other words, the opportunity space in which learning environment co-construction unfolds is limited by the boundary conditions of the learning environment. Therefore, it is crucial to better understand how students can play an important role in defining the boundary conditions of learning environments.

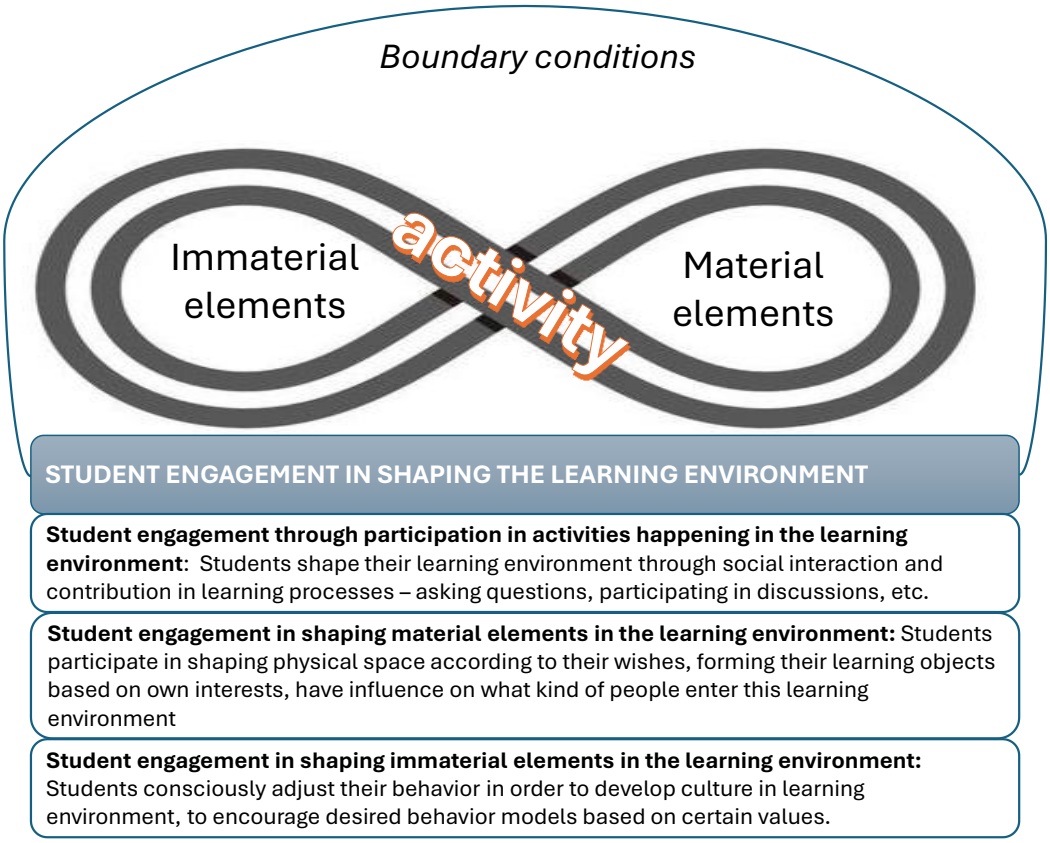

Figure 1. *Conceptual model of student engagement in shaping the learning environment*

Case descriptions

In this study, we focus on two cases, both situated at the same Norwegian university. Case I centres on student-initiated, teacher-supported elective courses, whereas Case II targets the student innovation centre at the university.

Case I: Student-initiated, teacher-supported elective courses

The first case concerns student-initiated, teacher-supported elective courses on sustainability. These courses have a special syllabus and provide European Credit Transfer and Accumulation System (ECTS) credits. From an administrative perspective, student-initiated courses use an exception in university guidelines. Traditionally, this provision has been mainly used for specialised PhD courses or activities directly related to master's thesis work. However, formally student-initiated courses are not limited and can be proposed by all students. This type of course offers more flexibility than regular courses, is run ad hoc and is not part of the regular course list.

This initiative was started in 2018 by one student and was continued by other students and teachers. Between 2018 and 2023, four courses were run, with two additional ones planned at the time data were collected in early 2023. The empirical material in this article derives from two of the finished courses but also draws on more general experiences with the approach. The courses are second-cycle (master's level) courses, and the majority of the students are enrolled in programs within the natural sciences.

Unlike regular courses, student-initiated, teacher-supported elective courses place the main responsibility for curriculum design and course organisation on the students. Within the context of the case studied here, the process of establishing a new student-initiated course is structured into four phases. Firstly, there must be interest from one or several students and a willingness and commitment to lead the process. Secondly, students must find a university teacher who agrees to be responsible for the course. Thirdly, the course must be announced, and more students interested in the topic are recruited. Finally, all documentation, including a course plan, reading list and learning outcomes, must be reviewed by the responsible teacher and submitted to the faculty for final approval.

Once the course is approved, students book rooms, organise seminars, and invite external teachers if necessary. Students and the responsible teachers communicate throughout the course. The course is assessed by an external academic, a formal requirement for a special syllabus.

Case II: Student innovation centre

The second case is a student innovation centre established 10 years ago as part of the science and technology faculty. It was started by two engineering students, who later became faculty members. The innovation centre has an explicit aim to offer students the possibility of working on industry- and business-related problems during their time as students. The centre addresses extracurricular, technology-related activities, such as organising workshops on technical skills (such as machine

learning, 3D printing etc.), and developing innovative solutions to real-world problems.

A key element of the student innovation centre is the physical space that this learning environment offers. This includes a maker space, office spaces for students, and other spaces for students to interact. Internally, this learning environment is often referred to as *student-driven*, where students have a considerable responsibility to run and maintain the space as well as introduce new students to different tools and approaches. One important role that students play is mentoring new students. While this has always been part of the culture in the centre, it was institutionalized[1] and became operational during the first year of the data collection stage. The university employs up to 10 active students to support other students, organise activities, and promote the centre at the university. In addition to the students, one or two administrative employees support the centre. They handle administrative duties (e.g., purchasing disposables for 3D printers and other equipment), as well as the recruitment of mentors. Three university teachers—two of whom were originally students who started the centre—have strong connections with the centre and play an important role in communicating with external partners, as well as supervising and guiding students when needed. The majority of students who are part of the student innovation centre are enrolled in five-year integrated engineering programs (combined first and second cycle studies).

Methodology

This study builds on a qualitative case study approach to explore how students navigate and engage with resources and boundaries when shaping learning environments. The two cases described above provide two different contexts situated at the same university. Rather than adopting a comparative study design, we are interested in exploring how student engagement unfolds under the distinct boundary conditions that both cases present. Accordingly, we aim to strengthen the analytical conclusions arising from the empirical data in comparison to a single case study.

The main empirical material was collected through focus group interviews, and semi-structured individual interviews with highly involved students and university teachers. The focus group interview for Case I included four students, and the one for Case II included eight students. Through these interviews, it was

[1] Students received the title of "mentor" and were officially employed at the centre on an hourly wage.

possible to gain insights into the students' perceptions of their learning environments and their engagement in defining them, as well as to draw on the students' discussions during the interview to obtain a more nuanced view. The focus group interviews were complemented by two individual interviews with highly involved students[2]—one from each case—to glean more detailed accounts. In addition, two university teachers involved in Case I and two in Case II were interviewed to gain a deeper understanding of the cases and to explore teachers' perspectives on the co-creation process with the students. Finally, we included two documents about the cases in our analysis. These provided descriptions of the cases and contextual information.

All interviews were audio-recorded and transcribed. Data were collected, handled, and archived following the requirements of the Norwegian Agency for Shared Services in Education and Research. All informants gave their informed consent to participate in this project. To maintain anonymity, all personal identifiers and some information in the quotations were removed. Parts of the data were gathered in Norwegian, and the translation into English was performed by the first author.

The analysis of the empirical material was guided by a thematic analytic approach (Braun & Clarke, 2021; Parkinson et al., 2016). Initially, we familiarised ourselves with the data and summarised each case separately, as Yin (2009) suggests for multiple case studies. In subsequent steps, we alternated between reading the empirical material and making connections to theory. Correspondingly, we used sensitising theoretical concepts connected to learning environments and student engagement, as described in detail in the background section and articulated in our conceptual model. Important concepts included student engagement through participation in activities happening in the learning environment, student engagement in shaping material and immaterial elements in the learning environment, and boundary conditions for these processes. Simultaneously, we were open to more empirically derived codes—for example, experiencing the learning environment differently than in ordinary courses. Finally, we structured the data using codes and cases and started interpreting the data.

The co-authors engaged in constructive dialogue during the data analysis and drew on their experiences and understandings. This was especially important and useful considering that all three authors contributed diverse perspectives. The first author had considerable prior knowledge of one case from earlier research and some awareness of the other case. The second author had no contextual understanding of the two cases but contributed perspectives from other contexts and

[2] An initiator in Case I and a mentor in Case II.

theoretical and conceptual framing. The third author participated in focus group interviews as a second interviewer (with very little contextual understanding) and contributed extensive experience in the data collection and analysis stages. The study was not performed from an insider's perspective, as the first author was not part of the group itself. Nonetheless, it cannot be considered outsider research, either. Different authors' perspectives fuelled valuable discussions during the analysis process. While the first author provided deep, contextual understanding of the cases, the second and third authors provided new and complementary perspectives to the analysis. We experienced that different research positions provide a variety of opportunities and challenges. However, we argue that our three perspectives enhanced reflexivity throughout the analysis processes (Dwyer & Buckle, 2009). In addition, the discussions during the analysis process also forced us to make explicit underlying assumptions and describe our approaches in detail and thus increase the transparency of the study. To sum up, the study has adhered to the quality criteria defined by Yardley (2000): sensitivity to context, commitment and rigour, transparency and coherence, and impact and importance. Sensitivity to context was ensured by reviewing relevant literature as well as ensuring ethical and curiosity driven investigation aiming at power balance. The setting—where researchers had no ongoing formal academic relation to the students, and students were anonymized in the study—contributed to students being able to talk freely. Commitment, rigour, transparency, and coherence relate to methodical data analysis, engaging in reflexivity, developing a deep understanding of the case and presenting authentic data (such as excerpts in the text). Finally, the impact and importance of the study are embedded in a better understanding of the students' role in shaping their learning environments as an emerging practice in higher education. In addition, focus group discussions gave students a possibility to engage in reflective discussion about their learning and their learning environments.

Findings

With the research question in mind—*How do students navigate and engage with resources and boundaries when shaping learning environments?*—and based on the qualitative thematic analysis of the empirical material, we identified three themes: educational approaches, student engagement, and negotiating learning environments.

Educational approaches

Educational approaches varied among student-initiated courses (Case I), yet all implied an active student role. One of the implemented courses used system-oriented design to address complex challenges faced by the local community in collaboration with the municipality, and another used place-based design and action learning to design an edible garden. Overall, it is clear from the empirical material that students want to and do take great responsibility for their own learning processes. One student shared: '[The motivation to initiate the course]: seeing a need for a more student-active, self-driven, self-motivated capacity; to create change; and also, being interested in some topics.' Another stated: 'My background made me believe in doing it this way. I wanted a participatory approach.' Students who joined courses rather than initiating them were often surprised by how different the learning environment of these courses was compared to regular ones.

Active student participation is also an integral part of the student innovation centre (Case II). The educational approach is regarded as novel for the university and its faculty. A key element highlighted throughout the empirical material is a focus on "learning by doing" and "learning by finding out things by themselves." In the focus group interview, students noted the importance of working on a project in a real-life setting, developing "real," "practical" solutions, and sharing their knowledge with other students.

Similar to Case I, the student-driven innovation centre provides the boundary conditions for a learning environment that is considered different. Students and the associated teachers describe the practical, experience-based educational approach at the core of the centre as complementary, yet contradictory to approaches that dominate regular courses (e.g., lectures in large groups). A student shared the following:

> I feel it is more aimed at the work world, while the others [regular studies] are aimed at research to move forward [in academia]. If you learn physics, it is for someone who will continue with research, but here, it is aimed at the business world – industry. If you work on a project, it is expected that you can learn that you create a product, that kind of thing. While in [regular studies, it] is more PhD-line research.

This quote illustrates, from the student's perspective, an interesting tension between industry and academia. The student experiences regular courses as academic, aimed at preparing students for university careers, whereas what they learn in the student innovation centre prepares them for working in industry. To some extent, teachers echo this difference, arguing that the centre complements regular courses and that

they have 'definitely developed a better education system than we ourselves had for our target [student] group.'

While the concrete educational approaches in cases I and II differ, the underlying foundation is the same, with students playing an active role. Furthermore, the empirical material highlights that the learning environments co-created in both cases are perceived as different from and complementary to regular courses.

Student engagement

Student engagement is central to both cases but unfolds in distinct ways. In Case I, the motivation to propose student-initiated courses stemmed from students wanting to learn and deepen their knowledge in a field where the university was not offering regular courses. As one student in the focus group interview explained:

> My specialisation is food. But the only courses that were offered in that specialisation had to do with meat, aquaculture and seafood, which I would say is not necessarily... If you want to develop a programme for sustainability transitions ... a lot of students wanted a bit more progressive, plant-based, alternative ... course.

This quote illustrates that students initiating courses have a clear idea about what is missing from regular courses and can argue why their proposed course is necessary and potentially interesting to other students.

As outlined before, students had the main responsibility for designing a curriculum and organising the course in Case I. It is clear from the focus group interviews that this approach had notable consequences for the students. Besides learning during the course itself, many students noted that they learned as much from designing the course. One student acknowledged that, while they expected to learn mostly about gardening, they learned the most about learning, itself. In designing a course, students drew on several resources that they considered relevant, for example, an exchange period at another university, other courses they had taken, and personal experiences and preferences. Students also used each other as resources (e.g., two students knew sign language and integrated that knowledge into the course). Furthermore, it is clear from the empirical material that students become attached to the courses that they work hard to develop. They shared that the course was more than 'just a course,' 'more like a journey.' and they experienced 'a lot of emotions and movements, a lot of ups and downs, it's emotional.'

Regarding the student innovation centre, students also indicated a very high level of engagement with their learning approaches. They spend many hours at the

centre, and as one student phrased it, because of them, the 'lights are on during late evenings' at the centre. Another student mentioned, 'If it is something that interests you so much, you manage to stand in here [difficult situations] longer.'

Furthermore, it is interesting to observe how teachers and students describe student engagement and responsibility slightly differently. When asked if the learning environment was student-driven, the interviewed teachers were not convinced. They argued that it was student-driven but within certain limits. Activities had to concern employability and work readiness, and various industries often dictated the boundaries. In other words, the students needed to respond to the demands of the industry and other external stakeholders. Conversely, students referred to the centre as student-driven. They noted that mentors especially have the responsibility for the social environment, and they take care of the physical space and equipment at the centre. They maintain equipment (e.g., the 3D printer) and advise other students on its usage. Moreover, they explained that students have the main responsibility of collectively creating a welcoming, inclusive social environment.

Students also emphasised the development of their individual educational trajectories. Some students shared that, although they study a specialised area, they "take" projects from another one to gain complementary knowledge. One student shared the following: 'When I look for a project, I look at the labour market. I'm studying robotics now, and robotics in Norway isn't that big yet, so I'm trying to make a Plan B for myself.' This quote illustrates that the development of individual educational trajectories or paths is a conscious process. One student shared that they keep notes about the skills they must learn in the future—these function as road maps for future project choices.

Overall, the students were deeply engaged in the activities in both cases studied here. This engagement leads students to seek alternative learning environments and to participate meaningfully in them. Furthermore, in addition to participatory engagement, this engagement has a strong emotional element.

Negotiating learning environments

The final theme from the analysis of the empirical material concerns how students and teachers negotiate and co-create learning environments and the roles that they assume.

While the process of designing a course (Case I) was acknowledged as an important learning opportunity and 'rewarding,' it was also termed 'frustrating.' The students described that it was not always easy to include all the different perspectives in the design process. One or a few students generally initiated courses, and 'others joined in the process.' Oftentimes, this created tensions and confusion

regarding roles different students play in the process. One focus group participant shared that they were not initially aware that the person talking in front of the class was a student—they thought it was a professor. The students who initiated courses explained that it took many hours and long days of preparation, hard work, and much stress to design a course.

Some students mentioned that this learning environment might not suit everyone. For example, one organising student shared the following:

> I was trying to have people with me, but I couldn't give them a safe environment. I said I would like to do this and this, but I didn't know if I would be allowed [by the university teacher]. I wanted to have everyone involved, but I didn't want to impose anything as an organiser. I didn't want to decide to do this and that, but for this group, that maybe wasn't the right thing. […] This particular group maybe would have liked that someone said, '[W]e do this and this'.

This quote illustrates the in-between positions that students obtain in student-initiated courses and the challenges that arise from them. In this landscape, it is apparently difficult for the students to balance how to involve others in the process, take responsibility, and make decisions.

Likewise, teacher interviewees explained that this co-creation was rewarding, yet challenging, for both sides. Teachers did believe in students creating their own education and stated that the educational approach students were choosing was important to them. One teacher even shared the opinion that the difficulties they had faced in collaboration could have been caused by different preferences for educational approaches. The students seemed uninterested in adding certain perspectives that seemed important to the teacher. Another teacher shared that the educational approach chosen for student-initiated courses was their main reason for agreeing to the role of the responsible teacher. Both teachers reflected that defining their role was a continuous process throughout the course (deciding when they should step in and when they should stay more remote). In the interview, a teacher defined their role as a conversational partner in the planning process and as a supervisor ensuring 'logical consistency or agreement between what is said and what is done.' Since students were the initiating force, they sometimes perceived teachers as limiting. Compromise with a teacher's wishes was required, with teachers being only a necessity due to the university's formal requirements. Meanwhile, the students appreciated finding a teacher who agreed to be responsible for the course because this was required.

Besides negotiating with students and teachers, all respondents mentioned structure-related limitations. Overall, it was difficult to register the course and find the right people for it. Setting all the elements into the form of a formal curriculum— including a learning agreement, predefined goals, and predefined learning activities—was both rewarding as a learning experience and challenging and frustrating at times. due to a lack of experience and navigating complicated procedures and documents.

For Case II, the analysis of the empirical material unveiled unwritten behavioural norms and preferred ways of behaviour at the student innovation centre. While participation in the centre's activities is voluntary and students are free to choose how much effort and time they want to spend on activities, there appear to be unwritten rules that are communicated among students. In the focus group interview, students described themselves and their expectations for other students as highly engaged, hardworking, proactive, sharing their own knowledge, and helpful. The students also indicated that they expected that students in the centre would be interested in the learning-by-doing educational approach. In the focus group and teacher interviews, it was mentioned that this kind of centre was not for everyone. One does not need good grades or a great deal of knowledge. However, one does need a high level of engagement and initiative to join the centre. Students experienced that the process of "entering" the centre and understanding informal structures was demanding, especially before the mentor system was established.

In the empirical material, it is also apparent that students think that if one wants to join the centre, one must be willing to accept its rules. As one student stated, 'If you want to be [at the centre], you have to accept the structure.' Simultaneously, it is clear from the interviews that rules and their negotiation are a long-term process. Some long-term developments or changes at the centre were mentioned, such as establishing and formalising mentor programmes, changing workshop organisation and other initiatives suggested by the students (e.g., a hackathon). Students can suggest acquiring new relevant equipment and shape the physical space differently. However, these changes are initiated by students who have long been at the centre. Most new students entering the centre were invited by friends or the two associated teachers. They encourage students who could be a good fit to the centre (engaged, interested in "learning by doing" approach), to join. Likely, this is one way to maintain the social norms and rules that dominate at the centre. Furthermore, students themselves uphold the centre's norms and rules because they want to belong to the community. Students mentioned much 'joy' from being at the centre and hearing 'about each other's projects.' This is an important reason for them to be involved.

The empirical material provides two slightly different directions for how students and teachers negotiate and co-create learning environments. In Case I, the focus is more on how students and teachers find themselves in new roles and how they use distinct resources to negotiate their position, whereas the empirical material for Case II illustrates more of a long-term process shaping the learning environment with its social norms and unwritten rules.

Discussion

The empirical material from the two cases provides glimpses into how students actively shape two different learning environments and how they engage with resources and navigate boundaries. In both cases, students were engaged at all three levels of our proposed model (Figure 1): 1) through participation in the activities happening in learning environments, 2) through shaping the material elements of the learning environments, and 3) through shaping the immaterial elements of the learning environments. While unfolding in slightly different ways, our findings indicate a two-directional flow between the learning environment and student engagement in both cases (Reeve & Tseng, 2011). The learning environment is both shaped by the students and shapes how they interact and learn. For example, students shape their learning environment by creating a new course plan, choosing their educational paths, and inviting friends to join. Meanwhile, this educational setting invites them to keep the 'lights on during late evenings' and put in the necessary effort.

The student-centred learning approaches (Land et al., 2012) that underlie both cases imply a proactive student role in defining meaning in the learning process and engaging in social interactions. Grounded in the empirical findings, we argue that active student engagement (in activities) is the first step and a prerequisite for the conscious co-creation of the material and immaterial elements of the learning environment—such as a syllabus with learning activities or the co-design of physical space. Of course, it is possible to invite a friend to a solely teacher-led lecture. Yet we argue that this addition of a material element (person) to the learning environment would minimally affect how it looks and would likely not encourage corresponding engagement.

In both cases, students played an active role in shaping the material elements of their learning environments, just in different ways. In Case I, students prepare a course description and invite other students and teachers to the course. In Case II, students shape their physical learning environment (equipment): they create artefacts through their projects based on future career paths and invite friends and

like-minded others to join. When students contribute to material elements, such as people, creating space for learning and developing other physical objects, the immaterial elements, such as common experiences and desired behaviour models, are simultaneously created or shaped. Through this process of co-creating shared experiences, values, and beliefs, an educational subculture can emerge which provides a contrast to other educational settings and potentially expands students' perspectives (see Venuleo et al., 2016 for more detail). An example of this can be seen in Case II: a shared, sceptical student attitude towards regular education (being aimed at academic work, not at work in industry).

From the interviews, the creation of these elements provides a valuable learning experience for students and is an important feature of the learning environments. However, it also might lead to challenges. Our data revealed that these kinds of environments might be experienced as 'not for everyone': elite in the sense that participation demands initiative and engagement. In addition, they are difficult to enter and navigate. This echoes findings from Barrineau and Anderson (2018) at The Centre for Environment and Development Studies (CEMUS) at Uppsala University, who suggested that students experienced operating in a bubble. Furthermore, it is interesting to witness how challenging traditional teacher–student positions can lead to new hierarchical structures. The two cases demonstrate that *student-led* does not automatically mean led by all the students in an inclusive way. This corresponds to a concern voiced in the partnership literature that 'some students are better connected' (Marquis et al., 2018, p. 64). In Case I, student–initiators had the possibility of deciding primary elements of the learning environment and present them to other students, invite like-minded students and teachers. In Case II, mentors had a great deal of responsibility for shaping elements of the learning environment. Working at the intersection of learning environments and student engagement, these are important elements to consider.

Our findings also suggest that educational beliefs, preferred ways of teaching and learning, as well as immaterial characteristics of a learning environment are crucial for students' and teachers' engagement and co-creation. In Case I, a teacher indicated that their professional interests in the educational approach were decisive for their engagement. In Case II, the students would not engage with the centre if it suggested lectures rather than "learning by doing" opportunities. Hannafin and Land (1997) rooted the design of learning environments in several foundations, among them psychological foundations that represent internal beliefs about how people learn. From our cases, we can see that in the co-creation of the learning environment, it is important that the students and teachers share these internal beliefs.

Moving beyond the three levels of the model, it is also apparent from the analysis that the boundary conditions surrounding the two learning environments play an important role. Both initiatives unfold and are situated within the boundaries of universities. At the same time, the students highlighted in the interviews that they experienced activities as highly relevant for work-life and in direct connection to real-world challenges. In Case II, students expressed tensions between theoretical knowledge (as requested by 'academia') and practical knowledge (as relevant to 'industry' and integrated into the centre), echoing the epistemological dichotomy between practical and theoretical knowledge highlighted by Sunnemark et al. (2023) in their work on work-integrated learning (WIL). Similarly, students in Case I emphasized the split between theoretical (lecture) and practical (learning by doing) educational approaches. While we did not focus on WIL directly in this study, we argue that this could be an interesting perspective for future research.

Returning to the boundary conditions, formalities regarding course registrations were mentioned as well as demanding negotiations between teachers and students. Formalising the curriculum, needing to describe learning outcomes, and securing alignment with activities can be demanding and experienced as rigid boundary conditions. Meanwhile, engaging with these underlying structures also provides students with learning opportunities beyond the course topic, which is potentially an empowering experience (Shor & Freire, 1987). Furthermore, we argue that to challenge boundary conditions, it is crucial for students to be aware of them and experience how they potentially limit activities. Grounded in these experiences, students can begin to engage in negotiations around these conditions and expand the opportunity space for courses.

In Case II, the aim that all projects must be connected to industry and external stakeholders creates clear boundary conditions for activities at the centre. These were included in the unwritten rules of the centre. These unwritten rules shape the desired behaviour at the centre. Even if our empirical material does not provide details on how these rules are developed and renegotiated, we saw glimpses of changes taking place, and students initiating changes. It echoes how change often occurs in academic settings—incremental and unnoticed (Clark, 1986). The students appear very reflective and aware of boundary conditions and unwritten rules in the interviews. However, it is unclear whether they recognise the opportunity space for change and renegotiation and how long students must be associated with the centre to do so.

An important difference in the negotiation of boundaries between the cases is the time perspective. In Case I, the boundaries are re-negotiated every time a student-initiated course is started, while in Case II, the boundaries are shifted as a long-term, incremental development.

Concluding remarks and implications

The aim of this study was to explore how student engagement can play an important role in shaping learning environments. Our findings shed light on how students navigate and engage with resources and boundaries when shaping learning environments in two different contexts. Using our proposed model (Figure 1) together with the empirical findings and the discussion, we argue that this study can be a starting point for other teachers and students to question and develop their own praxis with respect to student engagement and learning environments.

This study demonstrates how students and teachers, led by the same educational beliefs, can push the boundary conditions and co-create an opportunity space for different kinds of learning environments where students can play an active role in defining their education. Born from a perceived lack in their education, students created courses (Case I) and committed to various projects (Case II). Rather than viewing this perceived lack as a problem to solve, we argue that it is an inherent element of education as an unfinished, constantly evolving activity (Peters & Mathias, 2018). It creates an opportunity space for students to act and commit, corresponding with their values, which is an important part of the action competence that universities try to provide graduates (Sass et al., 2020).

Simultaneously, the study provides some insights into possible challenges. Firstly, student-led engagement might not be for everyone due to its voluntary nature, and it is important to consider who does not participate and why. One possible approach to mitigate this challenge would be to integrate elements from the two cases into ordinary educational activities to reach more students. At the same time, this would greatly alter the framing of the activities and processes. These kinds of learning environments may be perceived as powerful because they occupy an important niche at the university—created by like-minded students as 'sites of resistance'(Acai et al., 2022) against the university's norms and practices. Secondly, some boundary conditions, even though at first experienced as hindrances, can at the same time open new learning opportunities. The aim should not be to make things easier, but to use time to explore those boundary conditions and engage into open, equal, and genuine dialogue between students and teachers (Freire, 1970). With this as an underlying foundation, mutual partnership and learning can emerge within the learning environments that students and teachers co-create together (Bovill, 2019).

We hope that our model, findings, and discussion can inspire students and teachers to reflect on their practices, as well as to contribute to further research in

the area. While this study offers a starting point, more research is clearly needed to better understand how student engagement can play an important role in shaping learning environments and how this praxis can change the future landscape of higher education.

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Sigrid Gjøtterud, Professor Emeritus, has dedicated several decades to teacher education, higher education, and educational research, with a focus on utilizing action research to advance sustainable development.

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