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CHALLENGING THE AUDITORIUM: HOW TO FLIP A CLASSROOM IN A ROOM THAT CANNOT BE FLIPPED?

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ABSTRACT
For many students, the auditorium is the room that most embodies Higher Education. However, recent studies and developments in teaching methodologies in higher education, such as blended learning and the flipped classroom, have challenged this conceptualization of the auditorium. Results from a recent case study on blended learning at Oslo and Akershus University College, showed how the auditorium as a room challenged the implementation of the course and influenced the students' choice in how they wanted the curricular material presented to them. The inflexibility of the auditorium became a structural challenge, which constrained the instructor's ability to use teaching methods other than the classical lecture. Essentially, the room proved to be non-functional for implementing a blended learning course. This paper challenges the traditional layout of an auditorium as an answer to new educational paradigms in higher education. It provides recommendations for innovative re-conceptualizations of both what an educational room can be and how design implementations are important in developing a better understanding of universal design for learning. The suggestions underscore the role of the technological and physical design of educational rooms for creating more functional learning environments suited for new pedagogy and generations of students, as well as how new technology is relevant in the development of the future rooms of learning. In conclusion, this paper points at how the conceptual idea of a room for learning is a virtual, borderless, and technological room, as well as a physical place.

Keywords: Blended learning, flipped classroom, technology, engineering education, higher education.

1 INTRODUCTION

An auditorium is a symbol for higher education as a room of learning, a room where the student consumes information, in varying degrees of passivity or activity. New platforms of pedagogy have emerged through technology, and some of these are a challenge to the auditorium as it is not, in every educational programme, a suitable room for learning and dissemination of knowledge between students and professor. This paper focuses on how the design of a room has a major impact on how a lecture, and acquisition of knowledge, is conducted in technology and engineering fields for a diverse group of students. It does so through theories connected to the Universal Design of Learning and it's guidelines [1, 2]. Referring to a case study and an observational study of two different rooms, one traditional auditorium and one ProLab fitted for mobility in technology, with screens as well as furniture, this paper will discuss and look into new aspects of how a room needs to change to inspire and allow for creativity and mobility within the engineering educations – especially, but not only, for the computer sciences. This change implies willingness for an organisation to reconceptualise its use of rooms, as well as an understanding of how the design of a room can influence the design and quality of a course. Institutional theory provides a useful basis for examining educational norms, values and procedures. This article uses institutional theory to examine the relationship between the norms, values and procedures inherent in higher education and universal design principles and practices.

1.1 Analytic framework

Research on social institutions – i.e., norms, values and procedures – and universal design provide a useful basis for examining the environmental and behavioural opportunities and constraints in the classroom. This paper uses theories and models of social institutions and institutional change to examine the potential relationship between educational practices and the social norms, values and procedures for promoting and ensuring universal design for learning. Dacin, Goodstein, and Scott state that "[i]nstitutional theory has risen to prominence as a popular and powerful explanation for both individual and organizational action"[3]. Institutional theory emphasizes the influence of culture on decision-making. Institutions represent constraints on individual behaviour and tend to lead people towards a specific action or set of actions [4]. March and Olsen define an institution as a collection of established rules and organized activities and practices that perpetuates and changes over time [5]. According to the authors, "[i]nstitutionalism connotes a general approach to the study of political institutions, a set of theoretical ideas and hypothesis concerning the relations between institutional characteristics and political agency, performance and change" [5]. In other words, the authors argue that investigating institutions requires an examination of the relationship between features of the institution and opportunities for action. Learning arenas should be set up to allow for flexibility and task related adjustments. Barley and Tolbert have additionally argued that "… institutions are socially constructed templates for action, generated and maintained through ongoing interactions" [4]. From their perspective, institutions are in a constant state of renewal based on the behaviours of institutional actors. And what should be done? Possible actions might be to involve students and professors actively in the design process; gathering information and defining design criteria for the development of new learning environments.

2 METHODS

This paper uses qualitative data from an in-depth case study to examine the institutional constraints and opportunities for ensuring universal design for learning in practice. In-depth case studies provide a useful basis for examining a current phenomenon in context, where investigators have limited to no control over events [6]. George and Bennett describe case studies as an "instance [case] of a class of events [phenomenon]" [7]. Yin provides a more detailed description of case studies as empirical inquiries that "investigate a contemporary phenomenon in-depth and within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident" [6]. Thus, case studies provide a holistic examination of the meaningful characteristics of real-life events and provide a useful research design for understanding complex social phenomena [6]. This paper examines a unique case where the use of technology in teaching and learning has been adopted as a mechanism for promoting universal design for learning in practice. The case included the Flipped Classroom as a pedagogical approach. The flipped classroom approach acted as source of inspiration for both lecturers – i.e., as a way to broaden the terms of what a lecture is and can be – and for students as a way to provide multiple options for engagement, representation, action and expression. The case is based on a web design course offered during the Autumn semester of 2015 at the Department of Computer Science at the Oslo and Akershus University College of Applied Sciences. The course is a required introduction course for first-year, first semester students in computer science. The course includes approximately 280 students from three Bachelor programs, including information technology, applied technology, and software engineering. The flipped classroom approach used in the course aimed to distribute video tutorials to the students outside of the classroom and to conduct simulations, games and workshops in class. In class, the students also had the opportunity to vote for the topic and format of their next class. Game-based learning platforms were implemented as a way of engaging students in the learning process. As part of the case study, researchers gathered data on the use of technology both in the classroom and in individual and group study amongst the students. This data provides a context for understanding the role of the flipped classroom approach in achieving learning outcomes in relation to universal design for learning. The data included in-depth qualitative interviews and quantitative surveys with students and staff on their reactions and experiences with implementing the flipped classroom approach. In the interviews, students were asked to reflect on their own achievements and competencies both in their field of study and more general life skills. While this case study provides new evidence on the experiences of students in a flipped classroom approach to learning, the empirical data is not generalizable to broader populations. Additional cases and a cross-national comparative approach may provide further evidence and generalisability. However, this

article has deliberately chosen an in-depth examination of the flipped classroom approach in engineering education in order to question assumptions about the lecture as function and classroom as format in teaching and learning.

3 RESULTS

During the semester's fourteen in-class-sessions, eight of the sessions were open for the students to choose the format of how they would like a topic presented to them, and six were pre-planned as lectures. The 280 students were divided into two groups because of scheduling limitations, but both groups were taught by the same assistant professor. The four options of how material was to be presented were: a game, a simulation, a discussion or as a lecture. This decision was made at the end of each week's session in advance of the next class via the game-based learning platform Kahoot. The results showed that the students from the two different groups chose very similar options. For seven of the eight sessions with optional formatting, the majority of the students opted for the lecture format. Out of 6 surveys, between 42-57% of students selected the option for lecture. This compares to the other options, 13-19% simulation, 13-18% discussion and 12-31% game. During the in-depth interviews, the researchers questioned this choice and the answers were very much in relation to the lack of accommodation that the room provided for the other formats. The inflexibility of the auditorium became a structural challenge, which constrained the instructor's ability to use teaching methods other than the classical lecture. The auditorium was considered a room that made student communication difficult with everyone facing the same direction, as well as it limited flexibility in movement, and the students' use of technology. Essentially, the room proved to be non-functional for implementing a blended learning course. The results of the case study were conclusive in underlining how a blended learning course were further challenged by the design of the auditorium, and thus in constant conflict with the expectations connected to what was going to happen in class.

4 DISCUSSION

The format of the lecture is something that Higher Education has perfected over the years. The turn towards more technology-based teaching with blended learning approaches is thus challenging for both staff and students in terms of their expectations [8]. However; technology platforms do allow for higher education institutions to think differently about both methodology in teaching, as well as physical space, when it comes to how one uses a room and how a lecture can be structured. This paper gives focus to the design aspects of a room and how that influences the students' choices of a preferred learning format. Thus, this paper adds another prerogative to Bishop and Verleger's survey [8]. As an alternative to an auditorium there is the ProLab, the 'profession laboratory'. At Oslo and Akershus University College of Applied Sciences, the ProLab was built in 2014 and was based on the University of Minnesota's experiments with the Active Learning Classroom [9, 10]. With the ProLab the main idea was to research how a room could support, or limit, different pedagogical approaches taught in the STEM field. The ProLab was designed to facilitate active learning and group work amongst students. In the ProLab the room has a flat structure with a small podium at one end with a computer that can control, and have an overview of the different screens connected to eight group tables, each with a separate screen and with room for eight students to work. The screen in each group provides the opportunity to work on-screen, as well as allowing for a layout where web conferences and interactions can function wirelessly, allowing for the student group to communicate with a member of the group not in the room or with a project group based at another university. The ProLab itself is a long and narrow room. As the small podium is placed at the narrow end, it is difficult to hold traditional lecturers in this room – something that was planned as the room was built for flexibility in active learning and group work with supervision, as well as a room that eases communication on screen with the lecturer, a peer or discussions. In short, the ProLab was designed for a more blended learning base that would allow for different aspects of the blended learning platform than what the auditorium could in the case study. In her work from 2015, Komulainen examines how one can facilitate group based and problem based learning in a mathematics course through use of the ProLab [9, 10]. Her study showed positive results in terms of student performance. The case study in the course Web Project showed how the auditorium could not embody the diversity of a blended learning platform that would allow for a more active learning environment. However, the ProLab designed for this type of technology rich active learning is today not in use. Was then maybe the ProLab solution to more interactive and technology facilitated learning too demanding? Though the ProLab managed to

provide a platform for more interactive teaching, use of technology for communication both with the teacher, and creating a digital room for interaction independent of the room's walls – it still could not challenge the auditorium. In Komulainen's case, teaching in the ProLab demanded redesign of the course and development of new presentations and coursework. This illustrates the need for investments in pedagogical development as well as infrastructure.

The ProLab is a highly specialised room, maybe too specialised to become useful and accessible without reworking whole courses. It might then be better to reconceptualise the auditorium as an educational room. Which experience and which specifications can be extracted from the ProLab? There is a middle ground between the ProLab and a traditional auditorium that can provide a good platform both for active learning, group work as well as being a room for learning and lecturing. This paper will here present some suggestions in these regards focusing on the process towards how the engineer and design educations have to both understand and acknowledge how the relationship between teaching methodology and a room can challenge the students and their development in becoming competent engineers.

This paper poses a working title for an educational room that can function as a borderless, technological room and meet and engage students on one and several channels; 'The modular auditorium.' As auditoriums in their classical lecture format, they use mostly one channel to engage with students. However, a lecturer needs to meet students on many platforms regardless of the design of a room. Referring to the case study of an auditorium and the documented experiences with the ProLab [10], there clearly is a need to look into new aspects of how a classroom must change to better allow creativity and mobility within the engineering educations – especially for the computer sciences who do not have a direct line between design and engineering. We might 'allow' a more creative space in traditional engineering fields, especially as this is the norm in the design fields of engineering.

In Dr. Marie Leijon's article from 2016 she discusses, among other issues, how rooms affect the interaction between students and teachers and create meaning in the learning process [11]. She also points out the importance of being able to rearrange the rooms according to the learning process, and that in higher education, the room is a place for cooperation and collaboration – a place for activities. This might allow a more creative space in traditional engineering fields, especially as this is the norm in the design fields of engineering, and dynamic work environments are increasingly common in enterprises. Understanding the education of engineers means understanding how they use the space allowed for their education, and also how they are being prepared to perform in the work-world. Today's students are used to flexible learning environments from earlier education, and expect active learning styles also in higher education. They are also aware of the new workspace designs industry presents to promote themselves as attractive. This challenges universities to offer relevant learning facilities. We need to challenge the auditorium in order to do so, and create a room allowing for questions – allowing for students to learn *how* to find the questions and to be able to meet the lecturer to ask them. This simple principle indicates that teachers should have access to workspaces close to students learning areas. The Modular Auditorium, therefore, should offer some highly accessible technology that allows for varied education, but with a low user threshold. Important criteria of a 'modular auditorium' will have to be developed as a multi-disciplinary process including teachers, students and specialists from several competence areas, such as pedagogy, interaction design, interior architecture and design process management.

The NMC Horizon Report of Higher Education Edition from 2017 reports that key trends accelerating higher education technology adoption are, in a two-year perspective "Blended Learning Designs and Collaborative Learning"[12]. The changes in educational work-practice deriving from these developments indicate a need for development in the next three to five years to "Redesigning Learning Spaces". The change in pedagogic practice demands redesign of rooms to be able to meet the expectations of students as well as the teachers ambitions for better learning practice. The NMC Horizon Report also points out that adaptable learning spaces with movable furniture, display screens and WiFi, and enough outlets, can be modified to suit a variety of learning activities, including group work, hands-on tasks, and student presentations. This supports the presented idea of a "modular auditorium". In addition, dedicated working areas, such as makerspaces, incubators and innovation hubs are now common, and present new functions to allow for experiment and innovation, and might offer learning practices that challenge the classic auditorium. Such facilities may even be digitally connected to industrial partners, allowing students to engage directly with, and adapt to, the work-world. Pedagogic moves to adapt to new work and study practices are a driving force, and institutions

will need to use it as such in order to offer both digital surfaces for communication, supplemented by large flexible spaces in the building core suitable for individual- and group-work as well as teacher-student interactions.

5 CONCLUSION

This paper has so far identified that the pedagogic methods and the learning environment have to be developed in parallel and match each other. The case examples also suggest that the speed of development of teaching method, as well as technology, represents a challenge to the design of hard infrastructure such as buildings and interiors. A high level of flexibility will have to be planned for new interior solutions for higher education, to ensure that future developments can be accommodated. Engineering education should include design of the rooms that the students are to be educated in – and challenging the auditorium is required in this process. This paper provides new recommendations for how design aspects within education is important for understanding how pedagogy in higher education best can function in a dynamic and technologically evolving world.

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