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Transitions through remodelling teaching and learning environments

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ABSTRACT

Over time, and influenced by various stakeholders, a global trend has emerged regarding learning environments, pedagogies and learning skills for the 21st century. This article describes the transition of a secondary school building's physical learning environments through two snapshots; one from when the school was built and the other 9 years later. When new schools are built, a contemporary design theme is for the learning spaces to be pedagogically and physically flexible enough to facilitate multi-modal pedagogies that meet individual learners' needs. Compared to traditional forms of education and school buildings, an innovative learning environment design is considered to correspond more closely to these aspects. The results show a mismatch between the architecture and the pedagogical practices, and how the architecture was adapted to the pedagogical practice. The planning, designing, implementing and consolidating of new schools based on unconventional ideas about teaching, such as open-plan design, interdisciplinary co-teaching, flexible use of the learning environment and the creation of dynamic organisations is a complex enterprise.

KEYWORDS

Affordances; flexibility; physical learning environment; school organisation; teacher agency

In Norway, as in the other Nordic countries, several open-plan schools were built in the 1960s and 1970s. The influence for this kind of design and educational ideal came from the USA, England and Sweden. The arguments that were initially put forward for designing open plan schools included the provision of individualised learning, a variety of student group sizes and team teaching. However, research studies showed that teachers working in open plan learning environments perceived that the building's functionality did not align with their views of what was needed to support good teaching, which led to many schools reverting to more traditional layouts during the 1980s (Jerkø & Homb, 2009; Vinje, 2014). In the early 2000s, a transition towards schools as innovative learning environments (ILE) began in Norway. The concept of ILEs has evolved over time, and in this article, we use a definition from the Innovative Learning Environments and Teacher Change (ILETC) project led by the University of Melbourne: "an ILE can be defined as the product of innovative design of space and innovative teaching and learning practices.

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Innovative learning spaces are physical educational facilities designed and built to facilitate the widest array of flexibility in teaching, learning, and social educational activity . . . ” (Mahat, Bradbeer, Byers, & Imms, 2018, p. 20). Changing the design of school buildings from traditional classrooms into ILEs requires different types of transitions that are not only architectural, but also include new ways of organising the teaching and pedagogy in order to enjoy the full benefits of such spaces.

The aim of this article is to describe the transition of a secondary school building’s physical learning environments through two snapshots; the first is what the physical learning environments looked like in the architectural brief and drawings for the building project for the new school; and the second is what the learning environments looked like nine years later. The case study focuses on the remodelling of a building’s teaching and learning spaces by highlighting the changes that were made. Our intention is not to advocate for any one type of learning space, but simply to analyse a single case in order to gain insights into how learning spaces are continuously changing and how learning environments are developed.

The article is structured as follows. We begin by looking at the policy aspects that are related to learning environments from a macro perspective, mainly in terms of how architectural and educational ideas tend to travel globally. We then present a review of research studies on new learning environments, which is also used to discuss the case in the concluding part of the article. The case study and the remodelling of the learning environment is presented next. Finally, the findings are discussed and conclusions drawn about the remodelling of the learning environment.

21st century learning environments – built policy from macro to micro perspectives

Over time, and due to the influence of various stakeholders, a global trend has emerged regarding learning environments, pedagogies and learning skills for the 21st century (OECD, 2006, 2013, 2017; Saavedra & Opfer, ; Scott, 2015). In many parts of the world, e.g. Australia, New Zealand, the UK and the Nordic countries, the idea of “rebuilding and refurbishing projects that seek to produce specific pedagogical and identity effects (e.g. learner-centred pedagogies, twenty-first century learners)” has materialised (Mulcahy, 2016, p. 82). Charteris et al point to these shifts in education and highlight the link between global policy trends and local enactments: “We cannot divorce educational narratives – the technological, spatial and temporal focus of ILEs – from our wider material global context” (Charteris, Smardon, & Nelson, 2017, p. 808). The proposals for change stem from an outdated, historically shaped and universal teaching of direct instruction and rote learning that is considered ineffective for the development of 21st century competencies and skills (Carvalho & Yeoman, 2018a). From this perspective, when new schools are built, a contemporary design theme is that learning spaces need to be pedagogically and physically flexible enough to facilitate multimodal pedagogies that meet individual learners’ needs. Compared to traditional forms of education and school buildings, an ILE design is considered to correspond more closely to these aspects (Melhuish, 2011; Nair & Fielding, 2005; OECD, 2006).

But what happens when educational policy is operationalised in built form? Wood (2019) points to the links between such policy shifts and school architecture on a global scale:

Built policy – the urban planning, construction, design, use and coordination of buildings and their spatial organization – fulfils these criteria, buildings being special kinds of material and semiotic object that make them particularly apt as institutional forms of collective meaning-making and control, their ‘physical institutional structures’ are ‘spread across geographical space in order to provide a contextual scaffolding for the performance of various roles’. (Wood, 2019, p. 2)

Following Monahan (2002), Wood argues that built policy includes and extends “built pedagogy – the architectural embodiments of educational philosophies” (cf. Mulcahy, 2016). Just as policy implementation can be resisted and become a challenge, the same can happen when new school buildings are operationalised: “like policy then, architecture cannot guarantee any particular outcome in terms of what people actually do” (Wood, 2019, p. 9). Mulcahy (2016) also points to naïve assumptions of a linear and rational policy implementation process when principals, teachers and staff enact changes in policy in unintended ways (cf. Ball, Maguire, & Braun, 2012).

In line with policy change characteristics, the 21st century’s pedagogy and learning skills discourse also contains shifts in the built policy terminology. One example of this is: “the significance of recent shifts in labelling practices (e.g. from ‘classroom’ to ‘learning space’) representative of new vocabularies operationalizing a particular technologization or instrumentalization of education” (Wood, 2019, p. 10). But how are teachers and students characterised in the built policy, and how should the teaching and learning be organised? Furthermore, how and to what extent does the built policy correspond with the curricula that teachers are expected to follow so that students achieve the stated educational outcomes – especially at a time of ongoing internal and external assessments? In this context, identity and meaning-making are central aspects to consider. What kind of cultural cues do the new learning environments offer teachers, and do they correspond with the existing traditions in staff cultures (cf. Woodman, 2016)? What justifies the design of the learning environment? Wood (2019) argues that “a recurring theme is the contrast of ‘the past’ with the future (via ‘research’) but also with ‘across the world’ i.e. elsewhere”. Ideas about and arguments for school buildings and the design of learning environments are borrowed from other countries, adapted by different stakeholders and “scripted into a local, nascent discourse of transformation” (ibid., p. 12), which is then enacted by principals, school staff and students in the local school environment. Borrowing other countries’ educational ideas and policies is not a new phenomenon. The spread of ILE school buildings could reflect what Steiner-Khamsi (2004) describes as travelling reforms, in that they are moved from one context to another. However, a school building normally lasts for several decades, or even centuries. Thus, as countries with small populations and partly shared political and cultural histories, such as those in Scandinavia, do not have access to a lot of data about school buildings, it makes sense to cross international borders and compare and learn from other countries’ experiences.

Research on new learning environments

Designing and redesigning school buildings in order to develop the required physical learning environments that correspond with the teachers' teaching and the students' learning is a complex matter. In this section, we present a research overview that shows aspects to be considered when thinking about innovative learning environments. Several studies have recently been conducted in Australia, the UK and the Nordic countries on what is often called flexible, innovative or new generation learning spaces (see for Alterator & Deed, 2013, 2018; Bradbeer, Mahat, Byers, & Imms, 2019; Byers, Imms, & Hartnell-Young, 2014; Dovey & Fisher, 2014; Mulcahy, Cleveland, & Aberton, 2015). Several studies specifically focus on physical space, school design and indoor climate (Al Horr et al., 2016; Barrett, Zhang, Davies, & Barrett, 2015; Soccio, 2016). There is also novel research on how teachers use, appropriate and change to ILEs (Bradbeer et al., 2019; Daniels, Tse, Stables, & Cox, 2017; Deed & Lesko, 2015; Mulcahy et al., 2015; Sigurðardóttir & Hjartarson, 2016; Woolner, Thomas, & Tiplady, 2018) and the impact of learning spaces on students' learning outcomes (Byers, Mahat, Liu, Knock, & Imms, 2018). In recent years there has been an increased focus on and use of constructivist-oriented pedagogy, which has resulted in a shift from teacher-centred teaching to a more student-centred learning and a constant and widespread call for flexible learning spaces (Woodman, 2016). However, based on a research literature overview and case study results, Woodman argues that there is no clear definition of the concept of flexibility related to learning environments.

Other studies focus on a more holistic approach in new types of learning environments, such as Gislason's (2018) elaboration on the interrelation of physical design, organisation, educational culture and student dynamics. There are also studies on the collaboration between teachers and support staff from a relational perspective (Frelin & Grannäs, 2014; Grannäs & Frelin, 2017a, 2017b). The staff culture needs to be taken into account because it is a vital part of how teaching and the use of the learning environment are played out (Gislason, 2010). Gislason further argues that the organisation is a core component of the school environment. This becomes even more crucial in ILEs, where successful schools need to "have a cohesive organizational structure that can sustain unconventional practices" (Gislason, 2010, p 129; see also Sigurðardóttir & Hjartarson, 2016).

Some of the emerging aspects in the research area relate to what school leaders and teachers need in terms of ongoing support when creating new learning environments (Bøjer, 2019; Cleveland, 2016; Sigurðardóttir & Hjartarson, 2016). According to several studies, there is a need for teachers and school leaders to be continuously trained and retrained in environmental awareness and competence (Blackmore, Bateman, Loughlin, O'Mara, & Aranda, 2011; Bøjer, 2019; Bradbeer et al., 2019; Dane, 2016; Lackney, 2008; Leighton & Byers, 2020; Meland, 2015). These studies point to teachers' lack of spatial awareness and competence in achieving an optimal use of the physical space. How teachers work in open plan settings can significantly influence the spatial (un)responsiveness of their pedagogic practices (Saltmarsh, Chapman, Campbell, & Drew, 2015), especially if their teaching is not in line with the intended school design. However, as yet very few studies have been conducted on the links between teachers' thinking, the quality of their teaching and the learning that results in relation to the environment in

which the activities take place (Bradbeer et al., 2019), or on the preparation of teachers to work in ILEs (Charteris & Smardon, 2018b). Furthermore, Charteris et al point to an imminent risk “that the combination of a lack of well-defined discourse around ILEs reform intentions and inadequate support for teachers in how to actually orchestrate teaching and learning effectively in open spaces, may result in a historic recurrence where 1970s open plan initiatives were not capitalised on” (Charteris, Smardon, & Page, 2017, p. 27) and that the innovative learning environments of today might end up going the same way as the open plan school design of the 1970s.

Research on ILE designs and teaching points to the different kinds of opportunities and challenges that teachers can encounter in these new learning environments. According to Woolner, McCarter, Wall, and Higgins (2012), many teachers have conservative and traditional views about teaching and how classrooms should be designed and used, which can be difficult to change and challenge. Also, as Charteris and Smardon point out (2018b), teacher education does not always address the importance of learning environments. Other scholars have pointed out that only a limited amount of continuous professional development focuses on new generations of learning environments (Imms, Cleveland, & Fisher, 2016). This type of established conservatism is also evident in the sense that different policy reforms have a limited impact, often because changes are imposed from the top and by teachers who are not recognised as flexible or desirable. Challenges like these have been highlighted by Sigurðardóttir and Hjartarson (2016), who have shown that even with a collaborative design process in place, and a focus on the interdisciplinary co-teaching of mixed ages, many secondary school teachers (years 8–10) return to conventional ways of teaching in the classroom and have a much greater focus on their subjects than primary school teachers. This subject-based position and teaching is closely connected to secondary and upper-secondary school teachers’ professional identities (cf. Scott & Hannafin, 2000). Based on these findings, the authors argue that in order to make radical policy changes succeed and change established ways of teaching, it is important to bridge the gap between external demands and internal needs.

Lovejoy, Mow, Edwards, Prain, and Waldrip (2014) have identified teachers’ reactions to the affordances and constraints of open space learning environments, and how modern architectural versions of the open classroom facilitate different approaches to teaching. They also draw attention to the fact that “new settings entailed excessive noise, increased student distraction, loss of intimacy and structure, threats to traditional practices, exposure to the gaze and critique of colleagues, and demands for new team and individual skills” (p. 107). These situations are intertwined with what Charteris and Smardon (2018b) call a de-territorialisation and de-privatisation of the teaching profession in everyday practice.

As shown in previous research, the relations between teacher agency, the school culture and the school’s learning environment are complex. There are also gaps in the research in terms of a more holistic approach that highlights the complexities of the transition from traditional to new learning environments.

The methodology of our study

The data in this case study come from design briefs, blueprints and site visits (de Laval, 2014; Imms et al., 2016; Yin, 2009). Blueprints of the school building from its inception in 2010 and later in 2019 were collected in order to visualise and compare the changes

that were made as a result of the remodelling. Thematic analysis was used to identify the key themes and corresponding sub-themes in the briefs (Boyatzis, 1998; Braun & Clarke, 2006).

Any typology will simplify and, in this case, reduce the fine-tuned variations between every kind of learning space to benefit the analysis and understand the clusters. As a result of their analysis of 59 floor plans of primary and lower secondary schools from different countries, including Norway, Dovey and Fisher (2014) developed a typology consisting of six categories of learning spaces. The floor plans in this study have been analysed by classifying the different areas of the school buildings into spatial types according to Dovey and Fisher (2014) coding scheme, as shown in Figure 1.

Here, the spatial types that are used to visualise different spaces in the floor plans are presented. Based on this division of different spaces, we have coded the floor plans in terms of spatial types. In addition, we show whether the different spaces are open, openable or closed.

Following on from this design description, we start by describing the context of the specific case. After that we present the themes that emerged from the design briefs and the design of an innovative learning environment. We then move on to the floor plans when the school opened and again after 9 years of operation, and the remodelling of the learning environment.

Contextualising the case

There is a link between the first open plan schools in Norway in the 1960s and today's school architecture with ILEs, especially in terms of a child-centred pedagogy being emphasised from various angles. In this context, ILEs can be described as purpose-built, adjustable classrooms and breakout rooms, with the addition of shared spaces for

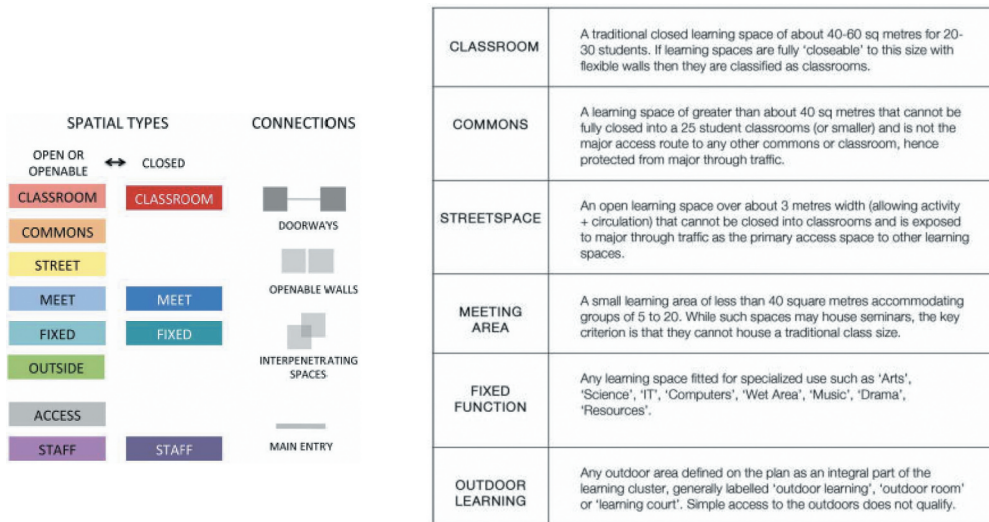


Figure 1. Dovey & Fisher's scheme for spatial types and colour legend (Dovey & Fisher, 2014)

designated activities. Individualised learning and collaborative learning are both regarded as important in ILEs and are also emphasised in today's school architecture.

As there is a decentralised ownership structure of schools in Norway, where the local municipality and county authorities own the school buildings, the development of school design can vary both between and within regions, although many of Norway's largest cities now have standardised design briefs for new school buildings that not only vary in the size of the floor area, but also in the choice of function and design. However, they all seem to highlight the flexibility of ILEs and include a variety of spaces for different teaching and learning purposes (Bradbeer et al., 2019).

For the school building studied here, there was a general brief from the local government as a basis, with participatory briefing processes being conducted for more detailed specifications. This case was part of a long-term plan for restructuring the schools in the region. In the design brief, the home base is defined as a set of different kinds of furniture and zones in which several different activities can be carried out.

When the case school was planned, designed and built, there was an intense and ongoing debate in the country's newspapers in which criticism of the open plan school concept was expressed by the teachers' unions based on teachers' experiences (Vinje, 2014). Against this contextual backdrop, we will now describe the studied school building.

Planning and designing an innovative learning environment

The school building was designed as an ILE and offered a variety of learning spaces. The design brief states that a user group, with representatives from the implicated secondary schools, was established in order to relocate teachers and students to the new school. In the architectural brief, the impact goals imply that the school facility and the pedagogical choices should be flexible. Flexibility is used as a way of providing learning spaces for different-sized groups, different content and pedagogies, and present and future school purposes. The main goal in the building project was to plan for a modern, future- and change-oriented school that inspired development and multiuse. A high degree of space efficiency was also expected. Regarding the quality aspects in the project goals, the intention was that the school building should be of high architectural and functional quality and flexible so that changes in pedagogical principles could be implemented quickly and without the need for extra resources.

The architectural brief also shows the local authority's requirements for the learning environment, e.g. that the school's facilities are designed in a way that promotes student learning, takes different learning styles into account, allows for a variety of learning strategies and methods to be used, accommodates different kinds of activity and enables the learning areas to be easily remodelled and regrouped. All these aspects are made possible by a combination of enclosed/screened rooms, open flexible learning spaces and special rooms that are designed and placed so that they can be used for a number of different activities. Regarding the working environment, it is emphasised that the building should provide direct daylight, visibility and transparency, and that teachers' workplaces are located close to the teaching and learning areas. The overarching

intention in the brief is solutions that provide good opportunities for overview by using glass for the internal walls and to provide a view of the outdoor environment. This is considered to provide an internal overview, to avoid negative or disruptive behaviour and contribute to a good learning environment.

In the brief, the design of the home base area is referred to as the students' home area and the space to which they belong. Most of the teaching and learning is expected to take place here in order to make the best possible use of the resources in the learning environment. The brief also takes various teaching strategies and learning environments into account. The home base areas are designed to be organised as six bases for 65 students and five bases for 90 students. The layout of a home base area consists of two presentation rooms, 3–4 breakout rooms, meeting rooms, common rooms and changing rooms/toilets. Some classrooms are to be closed, with walls and doors, while others are to remain open and flexible. The design of the home base allows for closed spaces for presentations and open-dialogue, and more open and flexible spaces for self-study and self-activity. There are also large auditoriums for presentations and group activities, smaller areas for conversations and tutoring, and areas for specialisation and reflection.

The remodelling of the learning environment

The case shows the remodelling of one of the floor plans, and [Figures 2 and 3](#) show the same section of the school building. [Figure 2](#) shows the section as it was built in 2010, while [Figure 3](#) shows the section as it appeared in 2019. In 2010, the case school had two classrooms ([Figure 2](#)) but mostly had common- and meeting rooms in accordance with [Dovey and Fisher \(2014\)](#) typology. The common rooms consisted of larger spaces (40–60 square metres) for 20–30 students. The meeting areas consisted of smaller spaces for less than 30 students. The school also had two classrooms on the third floor, marked in a peach colour in [Figure 2](#).

In the 2010 floor plan, the core ideas from the architectural design brief are recognisable as direct daylight and the provision of a variety of different sized teaching and learning spaces. The floor plans have been remodelled over time, which in this case means that the common- and meeting areas have been transformed into classrooms. At the time, the schools in the area had the authority to autonomously initiate and manage smaller building projects up to a certain sum of money, and the moving of walls or doors are examples of typical building projects within the given limits. The school is designed to meet future changes in pedagogy, which means that changes in the building are expected and planned for. As the content of education changes, it is common that school buildings also change to support the teaching and learning. For example, in the 1980s most schools in Norway created computer labs, which are now rarely seen and the space is instead used for other purposes. In the presented case, an area that had two classrooms in 2010 had five classrooms in 2019, and these are marked in red on the floor plan in [Figure 3](#). By 2019, the seven meeting rooms by the windows had been turned into three classrooms. The common areas in the main part of the building were turned into two classrooms without windows, which does not align with the national requirements for the size of learning spaces or the specification of direct daylight in the architectural brief.

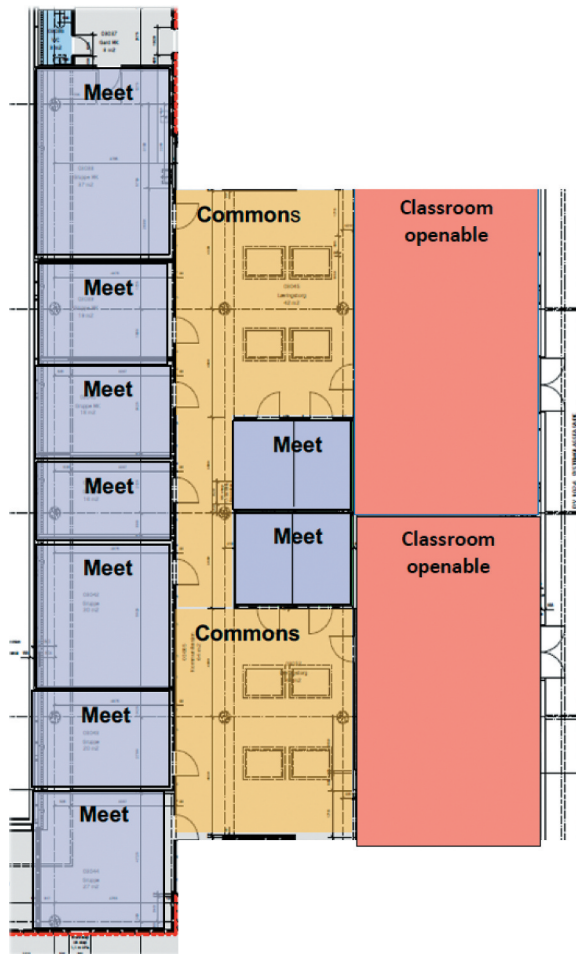


Figure 2. Section of floor plan in 2010

The most obvious change is that the school's physical learning environment became much more closed, and that the building in 2019 did not provide breakout spaces to support the teaching and learning in the classrooms. In the original plan, there were open common areas between the two presentation rooms and breakout rooms. In 2010 the building had a variety of learning spaces for groups of different sizes, and the 2019 building provided equal rooms for 30 students. The variety of differently sized rooms in the learning space that was offered in the original floor plan had disappeared by 2019. It seems as though the core ideas from the architectural design brief were ignored in the process of remodelling the school building.

The changes that were made indicate a tension between the built policy, the staff's pedagogies and how the learning environment was used. There appears to be a mismatch between the design of the learning environment and the staff's perceptions of how the teaching would work in everyday practice.

In the next section, we problematise and discuss the retransition of an innovative learning environment based on the review of research studies on ILEs.

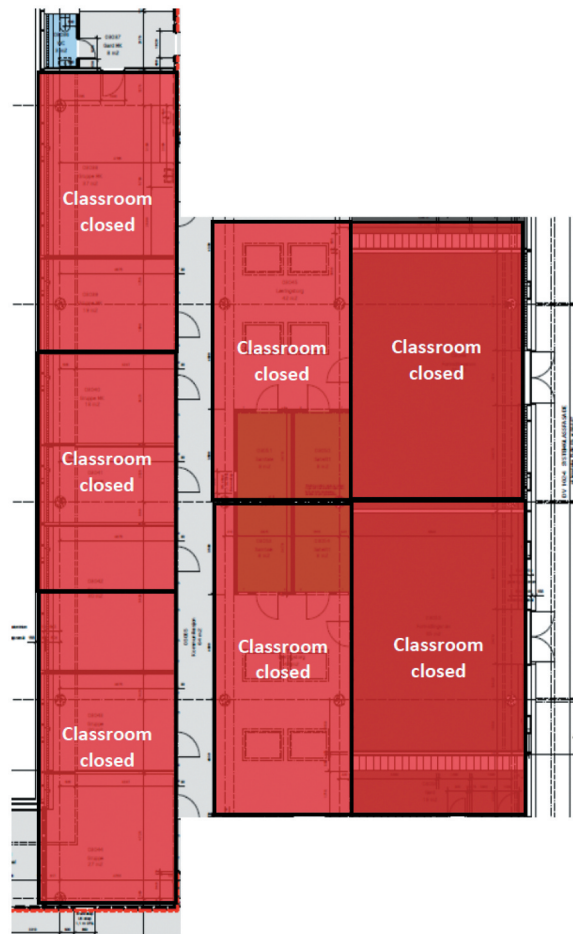


Figure 3. Section of floor plan in 2019

Discussion

In this article we have addressed the transition of a secondary school building's physical learning environments through two snapshots; one from when the school was built and the other 9 years later, by focusing on the remodelling of the teaching and learning spaces and highlighting the changes made in parts of the building.

When constructing a new school, the building and its learning environments should be sustainable and appropriate for the expected future (Monahan, 2002; Wood, 2019). This entails a transition towards a new learning environment that supports student-centred pedagogies and 21st century learners and skills (Carvalho & Yeoman, 2018a; Mulcahy, 2016). The case studied here is an example of built policy transfer. The design of the base area when the school was operationalised in 2010 largely corresponds with student-centred pedagogies, and is similar to other school buildings in the Nordic countries constructed in the same time period (cf. Wood, 2019). Based on the presented case, we argue that a phenomenon – a remodelling and retransition of an innovative learning environment back to a traditional classroom environment – takes place

between the implementation and enactment of built policy, which shows that consolidating practice in the new learning environment is not a straightforward process (cf. Mulcahy, 2016).

The case school's design brief is more progressive and in line with the idea of 21st century skills than how the ILE is utilised in practice. The brief refers to curricular reforms and student-centred learning and describes open learning spaces. The new learning environment is designed to be flexible and provide different types of learning spaces. In the presented case, the rebuilding suggests that there is some kind of mismatch between the new design of the physical learning environment and the intentions of the school staff who inhabit the building. Drawing on Charteris et al, it could be "that the architectural community are ahead of the education community in projecting twenty-first century learning spatial design and question whether ILEs can be seen as a discursive strategy to leverage change in educator practice" (Charteris et al., 2017, p. 809). If this is the case, is simply changing the physical learning environment enough?

What this case study shows is that policy reforms, the implementation of changes in the design of learning environments and the sudden introduction of new ways of co-organising secondary school forms with a new mix of staff are complex activities (Charteris & Smardon, 2019; French, Imms, & Mahat, 2019; Lovejoy et al., 2014; Mulcahy, 2016). Research studies show that such changes in the physical learning environment seem to be a particular challenge for secondary and upper secondary schools (de Laval, Frelin, & Grannäs, 2019; Sigurðardóttir & Hjartarson, 2016). Following Gislason, we argue that this is a multifaceted challenge that requires an appropriate fit between the design of the physical space, organisation and staff culture (Gislason, 2010, 2018).

The findings from the analysis of the floor plans show the transition from a variety of open or openable flexible spaces to closed classrooms. In the initial brief, flexibility in the home base areas is defined as a way of providing learning spaces for different-sized groups and different kinds of activity, and that these areas can easily be remodelled and regrouped. Furthermore, the design of the innovative learning environment is planned for pedagogical development, multiuse and a high degree of space efficiency. However, as these affordances were not perceived, the result is the rebuilding of the learning environment.

This type of retransition needs to be further studied in relation to pedagogical theories, organisation and teachers' spatial awareness and competences (Bøjer, 2019; Charteris & Smardon, 2019; Dovey & Fisher, 2014; Leighton & Byers, 2020). Drawing on Bøjer (2019), we would like to point to the importance of the activation phase of the building process, which starts when the building is ready to use and implies training and support for the stakeholders. In the presented case, a participatory design briefing is held with some representatives of the future staff, but the documentation does not show any training or preparations for work in ILEs for the teachers or principals. What this points to is a gap between the design phase, the implementation and transition phase, the consolidation phase and the sustainability/re-evaluation phase when the new school is established (Blackmore et al., 2011). When new schools are built, each phase is important in order to ensure a sustainable process and school building. For example, it is important from a participatory perspective to think about who will be

involved in all these four phases, especially with regard to competences, functions, positions, pedagogical vision and ownership.

A prerequisite – and also a challenge – with ILEs is that the design of the physical space requires organisational and pedagogical changes, since the teaching cannot be carried out in conventional ways. Open learning spaces limit the opportunities to teach one class at a time in a specific subject. In their studies of ILEs, Charteris et al point to challenges regarding the transition from traditional classroom environments to ILEs. Related to this, studies of socio-material aspects in new or remodelled school buildings have also pointed to the importance of the agency of principals, teachers and students in navigating ILEs (Charteris & Smardon, 2018a, 2018b, 2019). Furthermore, from a holistic perspective, something that often tends to be forgotten is that: “designing a learning space meant not just making a physical learning space . . . but also negotiating new cooperative patterns of interactions, meanings and future actions in the social and pedagogic-relational spaces of the school in preparation for new learning spaces” (Charteris & Smardon, 2019; Willis, 2014, p. 13). Another important aspect is time, in that the changing habits and behaviour of the school staff and students take time to adjust to (Lovejoy et al., 2014). For this to be possible, active participation and perseverance from both the management and the teachers is required to maintain the pedagogical vision for the learning environment.

Charteris et al suggest using the concept of territories, which also aligns with the physical learning space: “classrooms that have structured spaces are mapped with furniture and designed with static and predetermined purposes, can be described as territories” (Charteris et al., 2017, p. 813). For teachers who only have experience of traditional classroom teaching, the transition to a new ILE involves de-territorialising. Working in ILEs with up to 90 students in the base area, with open spaces and a relatively high degree of visibility, and an unclear ownership of the teaching space, means a turn towards the de-privatisation of teaching (cf. Charteris & Smardon, 2018b; French et al., 2019). It also involves different kinds of collaboration, with teacher colleagues and with the students. A transition to ILEs for the purpose of conducting 21st century pedagogies involves an increased degree of democratisation, where, for example, students are expected to be given greater opportunities to participate and influence decisions. The remodelling of ILEs to classroom environments can be understood as an expression of a conflict between design and pedagogical beliefs, such as traditions about how the organisation should be shaped, the teacher’s role and what is perceived as good teaching, as well as teachers’ concerns about changes that do not directly correspond to their task perceptions and experiences of everyday school practice. This understanding is in accordance with the fact that the changes made were to build classrooms for 30 students.

A basic idea behind the pedagogy and learning of 21st century skills is that students should take responsibility for their learning, both individually and together with others (Imms et al., 2016). A transition from a classroom of 30 students to home base areas in ILEs consisting of up to 90 students will also have consequences for surveillance aspects related to pedagogy, teaching and learning. One possible consequence is that the staff will need other technologies, such as information technology solutions and a variety of teaching activities, in order to create a favourable working climate, but also for the planning, implementation and monitoring of teaching and student performance. The transformation back to a traditional classroom environment can, of course, be reversed.

As learning spaces are continuously changing, the transformed version is probably not the last version for this school. Providing transformation options is also regarded as an important quality for a building.

With this single case, we have shown that there is a mismatch between the architecture and the pedagogical practices at the new school, and how the architecture is adapted to the pedagogical practice. Changing the physical learning environment does not necessarily lead to changed pedagogical practices in the expected ways. There also needs to be a fit between the building, the pedagogical vision, the school's organisation and culture, and teachers' conditions and abilities to work in the new and different physical learning environment.

Future research on the building of new schools should ideally study the different phases of planning and implementation, the transitions and consolidation of the everyday educational practices, and focus on the process of (re)negotiating how the physical learning environment is to be inhabited and interpreted by school leaders, teachers and students over time. Knowing who the vital stakeholders are and whether/how the pedagogical vision of the school building permeates the different phases are also important. Such a research focus can provide school planners, architects, principals, teachers and other school staff with valuable knowledge and insights.

To conclude, the planning and designing of new schools based on unconventional ideas about teaching, such as open plan design, interdisciplinary co-teaching, flexible use of the physical learning environment and the creation of dynamic organisations in order to cater for 21st century skills, is a complex enterprise that needs to be researched further.

Disclosure statement

No potential conflict of interest was reported by the authors

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