

Towards Typological and Spatial Diversities

Learning from the typological solutions of the Finnish comprehensive public-school buildings

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Abstract

The Finnish *peruskoulu*, comprehensive school, has succeeded well in the OECD's PISA study since the study was first carried out in 2000. This success is a result of the long-term development of compulsory basic education in Finland from the 1940s to today. The changes in teaching have also resulted in changes in the layout of school buildings. This paper explores how the Finnish physical learning environments have developed and supported evolving pedagogy throughout the history of comprehensive school.

This study is a qualitative and comparative case study, and the research questions are: What kind of a role have the comprehensive school physical learning environments played in the development of learning and education? How have the Finnish physical learning environments adapted to the development of pedagogy and curriculum reform? Questions like these are necessary to answer in order to support the transformation of physical learning environments towards diverse learning spaces, which serve the Finnish learning paradigm.

The spatial and physical learning environment is the physical part of the extensive concept of the learning environment. The physical learning environment should support the schools' and the teachers' ability to combine evolving pedagogy into their practices for good learning outcomes. Pedagogy is the social interaction between teachers and pupils, and it promotes learning. The quality of air, sound and voice, temperature, and other physical learning environment conditions have an effect on health and wellbeing. There is clear epidemiological evidence which proves that health and wellbeing impact learning. However, systematic research on the relationship between pedagogy and typology of school buildings is still needed. There is also a need to create understanding on how that relationship affects learning.

The study is based on a series of case studies starting at the beginning of the comprehensive school system in the 1970s and continuing through the development phases to the 2010s. The sampling of the cases was selected from school buildings reviewed in *the Finnish Architectural Review magazine* ensuring the architectural quality in the Finnish context. The buildings present either a solution typical to their time or solutions critical to the development phases. The building sizes vary, the number of students is dependent on the size of the school, the level of education varies, and the intended use may include some other

activities too, but the study concentrates on the general learning spaces of the buildings, and their relation to the underlying pedagogical paradigm.

The analytical framework is triangulated and applies comparative perspectives on the development phases of the building types. The selected methods consist of cross analysis of content analysis of the articles, timeline analysis of the evolvement of the pedagogy and learning spaces, the Finnish national core curriculum, the PISA results, and building design of the general learning spaces using a thematic coding frame. The results explain how the learning supporting spaces support users, how learning supporting environment support the didactic needs, and how the development of typology has evolved through the years towards typological and spatial diversities. They also may explain some of the trends in design aims through the history of comprehensive school and highlight the interplay and interdependence of pedagogy and spatial typologies.

Keywords: physical learning environment, learning spaces, school buildings, building design, pedagogy, architecture, diversity

Introduction

The Finnish *peruskoulu*, comprehensive school, has succeeded well in the OECD's PISA study since the study was first carried out in 2000. This success is a result of the long-term development of compulsory basic education in Finland that started in the 1940s, and aims to describe research based educational objectives, process of education, and evaluation with broad child centred perspective and social cohesion as one important goal in education (Sahlberg, P. 2011, p. 48). By 1977, all Finnish pupils attended the new education system, which provided equal opportunities for compulsory basic education for children between the ages of 7 and 16. Education is free of charge, including textbooks and materials. All the children are entitled to free lunches and student welfare services at the school. The new education system also required changes in the layout of school buildings. This paper explores how the Finnish physical learning environments have developed and supported evolving education throughout the history of the comprehensive school.

Architecture consist of functionality, spatiality and aesthetics, ignoring functionality in research omits an essential part of the architecture.

The spatial and physical learning environment is the physical part of the extensive concept of the learning environment. The physical learning environment should support the schools' and the teachers' ability to combine evolving pedagogy into their practices for good learning outcomes. The Organisation for Economic Co-operation and Development has stated that pedagogy is the social interaction between teachers and pupils, and it promotes learning. (OECD.org) The quality of air, sound and voice, temperature, and other physical learning environment conditions affect health and wellbeing. There is clear epidemiological evidence which proves that health and wellbeing impact learning (Woolner et al., 2007, pp. 47-70), how the classroom design impact pupils' learning (Barret et al. 2013, pp. 678-689) and thus, school design has an effect on student outcomes (Tanner, 2009, pp. 381-399). However, systematic research on the relationship between pedagogy and typology of school buildings is still needed. There is also a need to create understanding on how that relationship affects learning.

Most of the research on school architecture is done on the architectural settings, detached from teaching and learning practices (Gislason, 2010, p. 127), but as architecture consist of functionality, spatiality and aesthetics, ignoring functionality in research omits an essential part of the architecture. Physical learning environments can be divided roughly into two groups: traditional environments and learning supporting environments (Manninen et al., 2007, p. 53). Traditional learning spaces are teacher-oriented classroom spaces surrounded by walls, and learning supporting spaces consist of adaptive spaces that support group learning and individual learning and allow wider variation of

learning setups. Functionality and flexibility are the main drivers for the physical environments that support learning. These diverse physical environments support the key teaching situations between students and teachers, individual or pair work, small group work and large group work. (Kuuskorpi et al., 2011, p. 7) Physical learning environments should also enable aims of the personalized learning communities which simultaneously customize learning experiences to the individual and connect the individual to others in socially and intellectually meaningful ways. (Hamilton and Jago, 2010, p. 263)

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Methods

The study is based on a series of case studies starting at the beginning of the comprehensive school system in the 1970s and continuing through the development phases to the 2010s. The sampling of the cases was selected from school buildings reviewed in *the Finnish Architectural Review magazine* ensuring the architectural quality in the Finnish context.

The analytical framework is triangulated and applies comparative perspectives on the development phases of the building types and the Finnish curricula for basic education. The selected methods consist of cross analysis of content analysis of the articles, timeline analysis of the evolvement of the pedagogy and learning spaces, the Finnish national core curriculum, the PISA results, and building design of the general learning spaces using a thematic coding frame.

The analysis of the flexibility of the general learning spaces and building design applies assemblage theory using thematic coding. There are two kinds of flexibility enabled by architecture in assemblage theory by Kim Dovey and Ken Fisher (2014): convertibility and fluidity. Convertibility enables us to change the use of spaces from traditional to constructivist pedagogies. In other words, to change the setting, for example, sliding doors can be opened to bring down the walls. Fluidity or agility enables flexible flows from one activity type to another in the same space. This analysis is used to highlight the needed flexibility in educational settings.

Functionality is analysed from the point of view of the versatility of spaces that support different learning situations in the learning environments, such as group work and group learning, teaching group learning, and independent learning. The number of student entrances and the student traffic inside the building are also examined.

The curricula comparison was carried out by analysing the general goals of the curricula on the basis of the research literature in the field. In addition to comparing the general goals, comparisons have also been made between the emphasized pedagogical approaches in achieving good learning processes.

This analysis shows how the learning supporting spaces support users, how learning supporting environments support the educational needs, and how the development of typology has evolved. They also explain some of the trends in design aims through the history of comprehensive school and highlights the interplay and interdependence of education and spatial typologies.

Comprehensive school curricula and diverse space settings for learning

In the 1970 National Core Curriculum for Basic Education, the central driving forces were connected to outlining the learning and teaching goals. In learning, the emphasis was on practicality, application of theory, social learning, learning to learn, and lifelong learning. “The pupil shall be helped by providing knowledge, skills and abilities to accept themselves and to have an active, flexible, and creative attitude towards their environment, so that they can always find solutions that constructive for them and their communities in an everchanging and conflicted reality.” (POPS II 1970, p. 170.) Other repeatedly mentioned general goals for comprehensive education were developing the pupil’s personality, socialization, general knowledge, and co-operation skills.

The transition to the new system was done gradually in the 1970s all around Finland (POPS I 1970, p. 17). The comprehensive school of the 1970s was tasked to steer pupils to personal acquisition of knowledge, which had to be “efficient and sustainable” (Uusikylä 2006, pp.13-14). The comprehensive school also aimed to strengthen the idea of education being everyone’s right regardless of gender, social class, or place of residence. The goal reflects the 1970s faith in schools creating wellbeing, education, and equality (Uusikylä, 2006, p. 13).

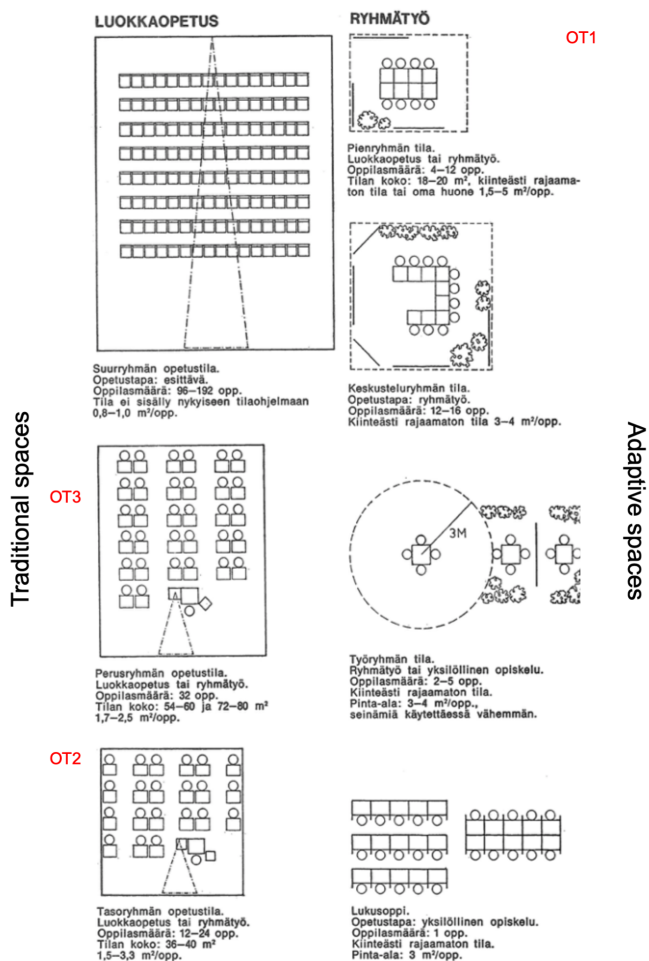


Figure 1. Variation of learning space settings, figure by Arno Savela. Space settings include both traditional and adaptive space settings. Most commonly used have been so called OT1, OT2 and OT3 learning spaces (OT = opetustila, learning space).

Space settings for general learning

Along with the education reform, the teaching spaces became more versatile and there was an increase in special-purpose spaces. In the 1960s, schools comprised of classrooms and the hallways connecting them. Only the comprehensive school reform in the 1970s changed the functional aspects of school buildings more profoundly. The construction of so-called hall-schools began. Their industrial and modular construction method allowed for flexible adaptation of spaces and structures. (Manninen et al., 2007, p. 61) The space settings support the teaching methods for group learning, classroom teaching, group work and individual work. The development of these space-settings happened in the early stages of the comprehensive school and they were presented in the Finnish Architectural Review. (Savela, 1971, pp. 34-36)

Case studies of the peruskoulu school buildings in the Finnish Architectural Review from 1970s to 2010s

The cases selected in the sample represent either solutions typical to their time or solutions critical to the development phases. The sizes of the buildings vary depending on the number of students, the level of education varies, and the intended use may include some other activities too, but the study concentrates on the general learning spaces of the buildings, and their connection to the underlying pedagogical paradigm.

Case Myllyhaka – Primary Comprehensive School by Architect Osmo Lappo

Figure 2. Convertability and fluidity of the learning spaces in Myllyhaka school. The plan is not in scale.



The first case is an innovative school building for 480 pupils from the early years of comprehensive school. The aim was to design learning spaces that support the new curriculum for comprehensive school teaching. Osmo Lappo designed the building, and he was active in developing the typology and writing about the new learning environment types. The building was completed in 1978 in Nokia.

The building is divided into three zones (A, B, and C) with an eye for adaptability. All space element types for general learning are present, and the emphasis is on the adaptive spaces and flexibility of the C zone. The spaces enable home bases, and there are sliding and folding doors between the general learning spaces. The measurements were based on modules, with structuralist intentions in architecture. Desks were already designed to enable forming groups. The spaces could be converted to create diverse types of pedagogical settings, and the convertible general learning spaces made fluidity possible. In the B zone, which includes the traffic and facilities areas, there were few student entrances, which meant heavy student traffic inside the building. At that time, the hallways were not considered to be good places for studying. The inner student traffic concentrated in the hallways, which generated noise. The A zone comprised of subject teaching spaces, the lunch area and the gym. In the spirit of the times, special education took place in its own wing, but the spaces there could also be used flexibly. The solution prepared for a more open and pupil-oriented methods of the future. The classroom walls could be dismantled, and the spaces could be connected to a larger central area or divided into smaller spaces as needed.

Case Puustelli – Multipurpose Centre by Architects Kari Järvinen and Timo Airas

By the mid 80s, all the comprehensive school students had the same curriculum and syllabus. The Multipurpose Centre in Helsinki was completed in 1985 and included the comprehensive school for 240 pupils. The building does not have many new pedagogical aims. The municipalities wanted the buildings to be multipurpose so they could be used more efficiently for other functions too, like as libraries. Some of the spaces were also used in the evenings for recreational use, and it was important to separate the learning spaces from recreational spaces. That is the reason for emphasising the street space in the middle (Fig. 3), which also highlighted the public use of the building. The school activities are almost subordinate to other communal activities in the building. The learning spaces are not very convertible or fluid. The diversity of learning space elements has already become narrower. The pedagogical aims were not described in the magazine article.

The state stopped funding school buildings in the 90s, and the funding responsibility for schools was transferred to the municipalities. This enabled the municipalities to have a more independent say in the contents of the projects. The information and communication technologies were also developing rapidly at that time, and computer classes were introduced in the space plan as one of the special-purpose spaces.

Case Soininen Primary School by Kaira – Lahdelma - Mahlamäki Architects

This school building is the result of a public architectural competition that got 182 entries. The name of the proposal was “City of Children.” The aim was to create a model for the school of tomorrow rooted in pedagogical aspects, since the Finnish National Agency for Education was loosening its grip on controlling school design. The school building was designed for 414 pupils, and it is located in Helsinki. It was completed in 1997.

The typology of the building already shows an improved number of different types of general learning spaces. There is a good amount of convertibility and fluidity in the general learning spaces, but still, there are quite a lot of corridors and hallways. The number of student entrances has also increased. There were some



Figure 3. Street space of Puustelli.



Figure 4. View through learning space of Soininen school.

complaints about the lack of group workspaces, but the versatile school building stimulates the development of several types of learning-enhancing practices. The school building was the first example of learning-units-oriented thinking in the sample.

Kaisa Nuikkinen authored a doctoral thesis on this building in connection to school architecture and wellbeing. She emphasizes: “Spatial and visual communication and transparency through the building makes it easier to use the common spaces for diverse types of didactic situations, this also increases the feeling of safety.” User participation in the process was also mentioned for the first time. The school building was seen as a teaching instrument for learning.

The First PISA Results

The first PISA results were received in 2001, and Finland was the highest-performing nation in the academic domains: reading, mathematics and science. As learning results or exams were never emphasized in comprehensive school, many educators in Finland were surprised of the results, since the goal was never to top the learning tests but rather to provide the children with equal educational opportunities and equity in education and to focus on music, arts, crafts, social studies and life skills as there was on reading, mathematics and science. (Sahlberg, 2011, p. 74). Before the first PISA results, there was plenty of criticism towards the comprehensive school as an education system. The results ended the criticism. It is notable that in the report of Ministry of Education (2002) it was concluded that only 12% of all school spaces in school buildings were flexible by this time in a way that enabled working methods other than those in the traditional classrooms teaching.

The same PISA results showed that Finnish pupils and principals found the school atmosphere much more negative on average than their peers in other OECD countries. Although this finding does not directly relate to the physical learning spaces, it signifies that the school atmosphere and well-being are known to influence students’ motivation and attitude towards learning. (Väliljärvi et al., 2002, p. 48)

Case Viikki Teacher Training School of University of Helsinki by ARK-House Architects

The Viikki Teacher Training School of the University of Helsinki provides both comprehensive and general upper secondary level education. 1,200 people work or go to school in it in Helsinki. Because the building is quite large and it has a substantial number of users, like many other schools built around the same period of time, the clarity of the spatial organization required special attention. In the article, the building is described as bright coloured learning factory, but the pedagogical aims of the spatial organization are not described beyond the clear entrances for pupils of different levels and the courtyards, which are connected to diverse types of subject teaching groupings by an internal street. The pedagogical aims are not described in the magazine article.

In large school buildings, creating a suitable scale for the pupils creates challenges. The question is: how to scale the building in a right way and how to make the orientation clear enough. According to the plans, the groupings of the learning spaces are not very convertible, which is surprising because new teachers are trained in these surroundings. Some fluidity is present, and there are smaller group spaces that add some variety to the general learning space settings. In this kind of a building complex, the low number of entrances for students means that there is a lot of inner student traffic going on at all times.

The national core curriculum for basic education in 2016

The new core curriculum for years 1-6 was introduced on the 1st of August 2016, in all Finnish schools. The higher years in comprehensive schools introduced the curriculum in stages: year seven starting on the 1.8.2017, year eight in 2018, and year nine in 2019. The goal of the current curriculum is to secure the competence



Figure 5. View to the restaurant area in Viikki school.

and skills of the pupils, support wellbeing, and to ensure educational equality (POPS) (2016). The goals reflect the 21st century goals of the realization of pupil-based learning in the Finnish society. The National Agency for Education concludes, “The pupils set goals, solve problems and assess their learning based on set targets. The pupils' experiences, feelings, areas of interest and interaction with others lay the foundation for learning”. Like the curriculum from 1970, the current curriculum emphasizes the pupil’s activity in acquiring knowledge and their active role as a learner. Comprehensive competence requires good skills in interaction and expression as well as gathering information from several sources and interpreting it.

The discussion of the new or open learning environments started in the 2010s, although the development of pedagogically supportive learning spaces had begun earlier. This may be due to the latest national curriculum, which puts more emphasis on constructivist pedagogies and team teaching. On the other hand, this discussion has resulted in wide variation of several types of solutions.

In the 2018 PISA results, Finland’s results declined slightly, but Finland was still among the top performers.

Case Jätkäsaari Comprehensive School by AOR Architects

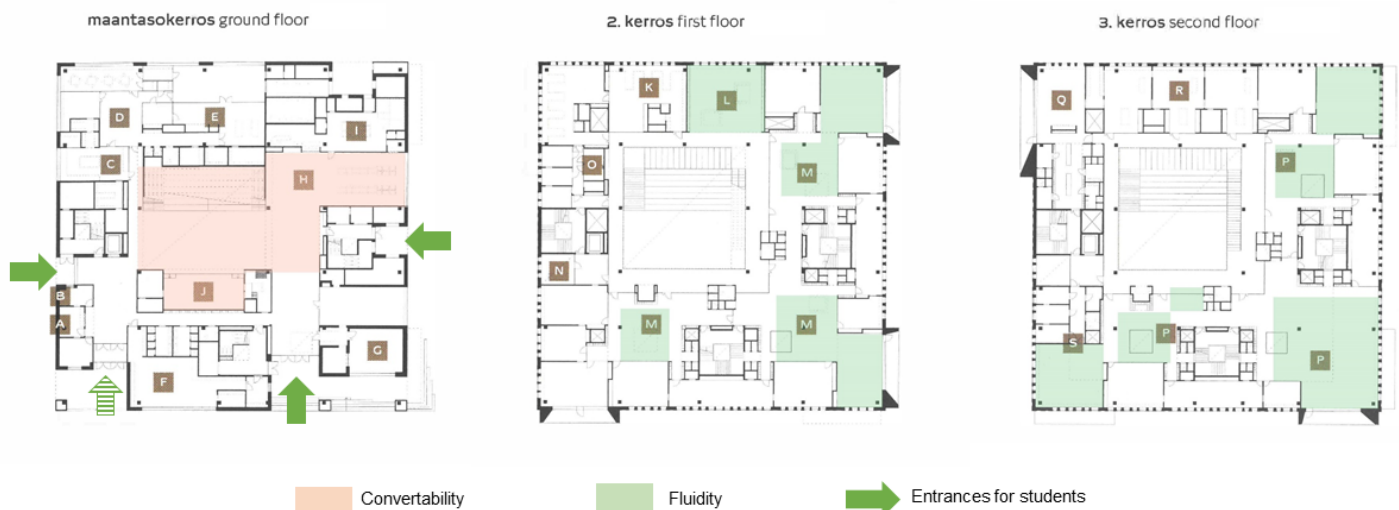


Figure 6. Convertability and fluidity of the learning spaces in Jätkäsaari school. The plan is not in scale.

The latest case is the Jätkäsaari comprehensive school, which was designed in an international architecture competition in 2015. The functional objectives of the competition were to find a well-functioning, comfortable, architecturally high-quality, healthy, and safe design solution that supports diverse working methods.

The facilities had to be multi-functional, flexible and safe, while supporting interaction and a sense of community. The building was to be divided into “home units.” Another objective was to create a corridor-free school. The multi-functionality was also emphasized because the citizens use the school spaces outside normal teaching hours. (FAA, 2016, 30) There were 135 entries in the competition, and the winning design was by young architects Erko Aarti, Arto Ollila, and Mikki Ristola. The building for 800 pupils in Helsinki was completed in 2019.

The article on the building was titled as “A Paradigm Shift” and the building was described in the magazine as follows: “The Jätkäsaari Comprehensive School is a pioneer in many ways: it is one of the first school buildings in which also spatial solutions support the new pedagogical objectives of the Finnish national curriculum, which came into effect just over three years ago.” “The Jätkäsaari school is based on modular, flexible space structure, which is seen to facilitate the integration of open pedagogy and collaborative teaching in line with the current ideology.”

The space structure is based on six learning units, which are laid out for different learning situations, such as open spaces, classrooms for quiet working, and small-scale working spaces. Thus, the building provides the pupils with different types of group work and individual workspaces. Also, the lobby areas of the building provide the possibility of imaginative small spaces to be arranged. The convertibility and fluidity of the general learning spaces has been improved, but the spaces may also have too much student traffic because of the number of student entrances to the building. The building is located in a quite urban area in the city of Helsinki, and the number of student entrances may not be adequate, which results in the traffic inside the building being quite noisy in some parts of the building, according to the plans.

Results

The aim of supporting pedagogy with learning spaces in comprehensive school has been present right from the very beginning of the Finnish comprehensive school system. At first, there were some challenges in the implementation of those aims due to the restricted technical solutions and finances, but we have also seen innovative examples of school architecture that supports learning. At the early stages, it was estimated that the new learning environments would require 20% more space than the traditional layout, which would mean more expensive school buildings.

At first, all the different space setting elements were in use, but later on the general learning spaces called OT1 for group work, OT2 for class or group work, and OT3 for basic group working began to dominate the school buildings. To get state funding for school construction, the municipalities were instructed to use these three space elements in the guiding workspace layout. Other types of adaptive spaces or the importance of variation of several types of adaptive settings for learning were not emphasized as much. As a result of this, over time, the guiding layout for workspaces became a normative design for spaces.

The flexibility of learning spaces is dependent on versatile space types and their inter-connectivity. If there is less variation in learning spaces, there are also less alternatives for pedagogical teaching situations. The sampling suggests that after an innovative start, the development halted, and for a long time, the learning spaces were traditional and not that flexible. When the funding for school buildings became the municipalities' responsibility, the typological solutions in school buildings began to also show more variation. Now we already have examples of school buildings that have flexible solutions, which provide versatile pedagogic support, and that have been created by taking advantage of pedagogic experts and user participation.

When looking at the basic goals, we can justifiably state that the goals of the first Finnish national core curriculum and the current curriculum are quite similar. The curricula emphasize all-round education and encourage to look for information beyond the textbooks. The curricula emphasize individual learning, streaming, the development of the pupil's personality, and giving up the boundaries between school subjects. From the point of view of the pedagogic goals, the basis for designing teaching spaces has changed astonishingly little.

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PISA testing does not provide a comprehensive analysis of the learning results, but overall, Finland has succeeded very well in PISA testing. Learning is also dependent on well-being, health and security, and the assessments do not express everything that has been learned.

Conclusions

A comparison between the curricula from 1970 and 2016 shows that the general goals are astonishingly similar. Both curricula emphasize the culture, well-being and equality created by education. In the light of the curricula, the schools are perceived as multipurpose centres, where social learning, learning to learn and lifelong learning are emphasized.

The foci of the schools built in the early days of the Finnish comprehensive schools and the newest schools are also surprisingly similar. The architectural convertibility and the presence of spaces of different sizes is emphasized in solutions in both the 70s schools and the 2020s schools. The significance of learning units and the larger spaces with learning stairs for teaching is emphasized during both periods as something that enables both formal and informal learning processes. Of course, there are differences too. In the 1970s, the spaces for special education were often separated to create a unit of their own, whereas in modern solutions the special education spaces are located with the learning units of the same age groups. As wireless terminal devices have become more common, the significance of lobbies as enablers of teaching situations has been emphasized, whereas in the 1970s hallways were used as spaces for traffic.

The special-purpose spaces for art and practical subjects have a lot in common, but in today's solutions the special-purpose space planning aims at enabling more diverse experiments and doing. Thus, the handicrafts spaces can also be used for robotics or for projects that require design and planning. Instead of the specific design of the 1970s spaces, the design of modern teaching spaces aims at creating spaces for each age group. Thus, the furnishings and tools in unit areas are different.

The paradigm shift in learning environments took place in the early days of the comprehensive school system, but the development has not been simple. At times, more traditional and stiffer learning environments have been more common. This was partly due to the state funding that favoured a more traditional classroom structure and multipurpose use to make operations as economical as possible.

Overall, it can be said that the solutions in many of the school spaces built in the 1970s provide a good starting point for reaching modern pedagogic goals. If renovated with modern materials, a school building like that is a good alternative for new construction.

It is justifiable to ask why the quality of learning environments has not been researched more, although the development of teaching and learning is based on research-based knowledge. Now challenges lie in the lack of research and good models on how to implement best practical solutions. There is a need for more qualitative research and further case analysis on the topic, especially on the recent learning environments.

The physical learning environment is a learning tool. Pupils have the right to learning spaces that support learning.

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