



## DESIGNING EDUCATIONAL BUILDINGS AND CLASSROOMS FOR LEARNING



One of European Schoolnet's key aims is to broker educational research findings and other evidence to our key stakeholders: ministries of education, schools, teachers, and industry partners. The *European Schoolnet Perspectives* series is one way through which we achieve this.

Two issues are published annually. Each issue aims to:

- Summarize research evidence from key studies on innovation in education;
- Translate this evidence into concrete ideas for policy action;
- Conclude with the implications of the evidence for using technology in teaching and learning.

All issues can be accessed online: [www.europeanschoolnet.org/resources/perspectives](http://www.europeanschoolnet.org/resources/perspectives)

Comments and suggestions on *European Schoolnet Perspective* are welcome: [info@eun.org](mailto:info@eun.org).

**European Schoolnet** is the network of 34 European Ministries of Education, based in Brussels. As a not-for-profit organisation, we aim to bring innovation in teaching and learning to our key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners.

[www.europeanschoolnet.org](http://www.europeanschoolnet.org)

[@eu\\_schoolnet](https://twitter.com/@eu_schoolnet)

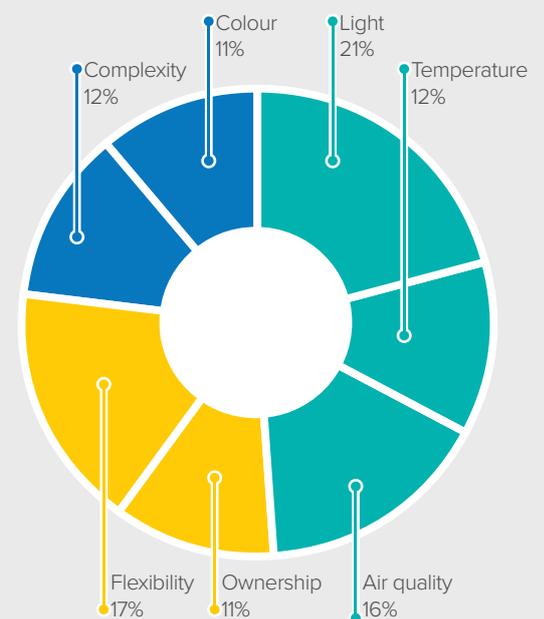
[european.schoolnet](https://www.facebook.com/european.schoolnet)

How to design schools that are efficient, inclusive and conducive to learning? What are the present requirements for educational buildings at a time when curricula are defined by competences, including digital competence, require a diversified repertoire of active teaching and learning practices, and a different organisation of school time and space? How to integrate in the design of the learning space the recent findings from cognitive sciences about the way students learn? In a nutshell, how to better design the space for nowadays required learning?

This Perspectives issue aims at summarizing the main findings from research and practice shedding light on the relationship between the learning space and the way student learn and teachers interact. This topic is high on the educational policy agenda of many countries worldwide. New schools are to be built, old ones need to be renovated. Meanwhile, on a daily basis classrooms' space are being revisited by their users to become compatible with group work, collaborative learning, and other student-centered approaches. Policy-makers, school leaders, teachers and all stakeholders looking forward to spaces better supporting needs of students and teachers are concerned with two main questions: how to design such spaces? Once built, how do we know those spaces are indeed conducive to better learning in practice?

Since the opening of the Future Classroom Lab in 2012 in its premises, European Schoolnet work on these questions and is about to launch a research programme on the topic, associating all similar Labs inspired by the FCL that have been created in many European countries and are interested to join.

### FACTORS SIGNIFICANTLY INFLUENTIAL ON LEARNING PROGRESS



Source: Barret, P.S., et al. 2015. "The Impact of Classroom Design on Pupils' Learning", *Building and Environment* 89, 118-33 (layout revised)

### BACKGROUND INFORMATION

The evidence base addressing the impact of physical learning environments on student learning is growing. A report published by the World Bank Group, *The impact of School Infrastructure on Learning - A Synthesis of the evidence*, drafted by Peter Barrett & al. cites the HEAD study comparing the contribution of three groups of space-related parameters on learning progresses: naturalness like light, temperature, air quality and sound, accounting for half of the impact; individualization like flexibility and ownership, and stimulation like color and complexity, each accounting for a quarter of the impact.

## FINDINGS

### Aligning curriculum, teacher capacity and physical space

#### Evidence from the analysis

Most education systems have re-defined the student curriculum at some point during the last two decades. They moved from a focused definition of the structure of the content in a specific subject to a more comprehensive definition articulating knowledge, competences, attitudes, from a discipline-based but also problem-based or outcome-based point of view. Pedagogical approaches such as collaborative learning, blended learning, flipped classrooms, team-based learning, peer-to-peer learning, case or problem-based learning, interactivity and discussion have entered curricula, and step by step practices in classrooms. Strategies aiming at aligning the physical

learning spaces with such new type of curricula are still to be designed and implemented in many cases. To a certain extent and in some contexts, existing physical learning spaces, even recently build, are even obviously in opposition to curriculum change or development process and don't connect to new thinking about learning. They sometimes still reflect a 'one to many' type of transmission. Learning physical environments don't succeed by themselves. Their alignment with the curriculum is a critical success factor to be conducive to learning progress, as much as teacher capacity to use the space. Motivated and educated teachers – and to

some extent students – have to be supported to acquire the specific competence of making best use of the environments in ways that align with competence-based curricula. As underlined by Nordquist et al. (2015)<sup>1</sup> "... end users need to be prepared to use the spaces successfully: what are the ideas behind a space, what is its purpose, how can it be used, how does the technology work?". Lack of such alignment often lead to newly built educational spaces reflecting old ideas about education. If teachers are not well prepared, they may simply revert to 'default pedagogies', i.e. transmissive and teacher-centered approaches, rather than explore innovative practices.

#### BACKGROUND INFORMATION

*The importance of the alignment between the curriculum - to be understood in its broad sense - and the design of the learning space is a strong and powerful concept to guide policies, implementation strategies and change in practice in a consistent and sustainable way. Jonas Nordquist from the Karolinska Institutet, Stockholm is one of the leading researchers on the topic. More details can be found in the article referred to in the footnote.*

#### Ideas for policy action

- When introducing new flexible learning space in schools, plan in parallel training actions targeting teachers about how to use the space depending the teaching and learning processes to be implemented and make explicit the relationship with the curriculum; support like guidelines, teaching scenarios/lesson plans, practice videos, etc. might be available in existing labs and online (European Schoolnet FCL website; <http://fcl.eun.org/>)
- Encourage initial teacher education and professional development organisations to integrate into the training they offer modules about the importance and purposeful use of the physical learning space when they address active teaching and learning methods. Support the integration of one learning lab into those organisations, or at least their access to such type of places at reasonable distance.
- Support teacher collaborative learning about the use of new flexible spaces through discussions, observations, etc. as a way for them to discuss about challenges and share inspiring practices especially during the starting phase of a learning Lab.

### Learning space and student learning outcomes

#### Evidence from the analysis

The possible effects of learning spaces on student learning have often been claims in the literature but rarely substantiated with empirical evidence. Major attention was given to the design phase (quality of conditions, tangibles, perceptions) rather than considering what happens once users are in the space. The focus of research is progressively moving to educational practices and impact on students learning outcomes.

Simply capturing learning outcomes is in itself a challenge as they broadly include social, affective, emotional and cognitive changes in students. As listed by Blackmore et al. (2011), learning outcome indicators can cover:

- attainment as measured by standardised test scores,
- pedagogical effects as indicated by improved engagement in learning,
- perceptions of improved quality of student/teacher, teacher/ teacher and student interactions,
- evidence of increased student interpersonal competencies, engagement and team work,
- individuals' perceptions of belonging and inclusion, self-esteem and self-confidence,
- wellbeing in terms of physical comfort, health, and sense of safety,

<sup>1</sup> Jonas Nordquist, Kristina Sundberg & Andrew Laing (2016) Aligning physical learning spaces with the curriculum: AMEE Guide No. 107, Medical Teacher, 38:8 (p. 764)

- behavioural indicators related to engagement, retention, vandalism, absenteeism, disciplinary incidents, violence, disruption in class, lateness, etc. .

As mentioned previously in this Perspectives issue (see Background box on page 1), the HEAD study (Barrett et al. 2015) specifically looked at the relationship between learning space and student academic achievements. 3,766 pupils spending most of their school time in one classroom over a whole year, from 153 classrooms in 27 primary schools out of three UK regions, were involved. The analysis recorded the particular classroom occupied by each pupil along with their starting and finishing scores in the core subjects of reading, writing, and mathematics. The measures of the physical characteristics of the classrooms could be isolated from broader factors at the classroom level such as teacher quality.

The HEAD study confirmed that variations in the physical design aspects of their learning environments explained 16 percent of the variation in the learning progress made by the pupils over one year on averaged across the three subjects. Around half of this percentage was due to the naturalness factors, with individualisation and stimulation accounting for roughly one-quarter each.

Student engagement being a high predictor of student academic success, some research focuses on the relationship

between learning space and engagement (rather than achievements in score tests as in the HEAD study), Scott-Weber et al. (2018) developed two indexes to measure student engagement on the one hand, and teacher engagement on the other once teaching and learning in new learning spaces. The two questionnaires have been run in four high schools in the US during 2017 fall. Findings showed the building's design overall makes a statistically significant positive difference regarding students' academic engagement levels, while the overall culture of the school is considered far more important for teacher engagement than the physical layout.

While still growing, existing evidence about the relationship between learning space and learning outcomes reveals that many aspects of physical learning environments may contribute to improved learning outcomes. The link is not direct and causal though, but rather indirect and conditional (OECD, 2017)<sup>2</sup>.

Taking distance from the strict learning outcomes points of view, the relationship between learning space and student well-being is receiving increased attention. Interestingly, such pilots research projects directly engage students in the process

as a way to reach a better understanding of their spatial expectations, needs and requirements for school and learning space design. Those projects can also include digitally supported method to be used by the students themselves like in the MoMe@ school German project. The toolbox used in this pilot study provided interesting first hand material underlining children's need of a variety of different and flexible environments for physical activity, relaxation, concentration, and play, which sometimes do not correspond with traditional/initially planned layout of the school facility.



## BACKGROUND INFORMATION

*Post-occupancy evaluation method (POE) is a frequently used method to appraise learning spaces. While different approaches and interpretations co-exist, the core of it can be summarized as “a process of systematically evaluating the performance of buildings after they have been built and occupied for some time” (Preiser, 2002, p. 42). POE is a process that involves a rigorous approach to the assessment of both the technological and anthropological elements of a building in use. It is a systematic process guided by research covering human needs, building performance and facility management.*



## Ideas for policy action

- When undertaking or subcontracting impact assessment of learning space on student learning, dedicate attention to what is meant by ‘student learning’, making sure it’s precisely – and realistically – defined, and how the specific impact of the space is measured out of the other possible influential characteristic (school culture, teacher competence, etc.).
- When trying to identify the needs to which the learning space should respond, consider the interest of collecting first-hand information from the end users and include student views in the investigation.

2 Group of national experts on national learning environments, *OECD framework for a module on the physical learning environment*, OECD 2017, EDU/EDPC/GNEELE(2017)6; (see p.23)

## CONCLUSION

Evidence from research, policy and practice suggests key interconnected elements necessary to sustain innovation and ongoing improvement of student learning in relation to the spatial dimensions of schooling, including:

- the school organisation and whole school processes and practices that inform an ethos or culture of inquiry and learning;
- sustaining teacher, community and student voice gained through participatory design, and embedding participation into everyday practice and decision making, thus enhancing teachers' and students' sense of self efficacy and agency;

In 2020, the European Schoolnet will launch a research programme, co-defined with other FCL type of spaces across Europe. The above mentioned findings from research will be taken into account in the conceptual framework backing that research programme.

Depending on the research questions to be agreed, the following aspects might receive interest:

- the processes and preparation required to transition into new spaces
- the transfer of expertise in using new spaces - acquired during teacher training – to the regular classroom settings; and the impact on teaching and learning practices of the co-existence of new learning spaces and 'old' ones within schools
- the development and use of flexible learning environments in ITE organisations
- the types of practices and social interactions that emerge in new spaces and how these may change over time,
- the organisational cultures and leadership at whole school level that facilitate or impede innovative pedagogies in new spaces,
- the relationships between virtual and built environments,
- teacher professional identity and new physical spaces
- the experience of the learners/students when using those new types of spaces, as well as their needs
- etc.

A distinction will be made concerning the stage of development of the FCL type of spaces concerned: are they in their design phase, in their implementation phase, already in the consolidation phase, or are they considered sustainable and even possibly in a re-design phase? Such timeline and sustainability perspective are important to be considered when designing intervention and interpreting findings.

### **What the research shows**

More generally, research since the early days of technology in schools shows that ICT can:

- Support innovation and new ways of organising learning in time and space;
- Support effective pedagogies, notably active learning, collaboration, project-based learning, independent learning and personalisation;
- Motivate and engage students and help them understand complex concepts, providing them with richer and more compelling learning environments, and improving productivity;
- Support access and inclusion, in particular of students with disabilities, those with learning difficulties, and those from a different language background;
- Help students develop digital age competences, including higher order thinking skills, creativity and digital competence;
- Enable new forms of feedback and assessment, including learning analytics and adaptive learning, games and simulations;
- Make possible activities that would otherwise not be possible for example showing dangerous experiments, enabling collaboration over distance, and involving outside experts;
- Prepare students for life and work after school and to play their part in a society which has transformed the way young people communicate, seek help, access information and learn.

### **3 key factors for the successful use of ICT in education**

- 1.** The school needs to have a positive culture of innovation, reflection and improvement;
- 2.** Technology has to be fit for purpose, accessible and perform reliably;
- 3.** Teachers need appropriate competences and support.