Author(s): Lievonen, Mirja; Kinnunen, Päivi

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Main features of an ideal learning space:

A user-based description

Mirja Lievonen
Faculty of Information Technology, University of Jyväskylä, Finland
mirja.a.lievonen@jyu.fi

Päivi Kinnunen
Faculty of Information Technology, University of Jyväskylä, Finland
paivi.a.kinnunen@jyu.fi

Abstract

This paper presents a method to define an ideal learning space from a key user perspective. The target group, upper secondary school students in a Finnish city, was addressed through two online surveys. In these we sought to establish the features that the students considered to be most important in a learning space. The aim was to adapt the redevelopment of school premises to the users' cultural practices. Two survey methods were employed in the surveys. In the first, students described in their own words what makes an ideal learning space. In the second, students assessed a list of 21 features using a three-point scale. They also assessed a list of 19 learning space factors in terms of their negative impact on learning. Furthermore, the students indicated the top four features on the list of positive impacts on learning. The three lists were then aligned in the analysis to discern possible discrepancies. Finally, in order to establish the main characteristics of an ideal learning space, the top-feature lists were compared to the students' verbal descriptions of an inspirational and motivational learning space.

It is important to take into account students' subjective experiences and preferences for various learning situations in order to design enabling settings that support interaction and communication as well as focused work and critical reflection.

Introduction

New layers of innovation continually mould daily practices (e.g. Rogers, 1962) – at times to a disrupting degree. Due to the rapid adoption of mobile ICT, there has been an unprecedentedly rapid context change in the span of a couple of decades. To take one example, between 2000 and 2014, the global growth of Internet penetration was, according to Internet World Stats, 676.3% (InternetWorldStats, 2014). In many parts of the world, the growth was even higher. By the end of 2014, the number of Internet users is estimated to approach 3 billion (about 40% of the world's population) and mobile phone subscriptions to reach almost 7 billion (ITU, 2014).

In the midst of ICT evolution, it is clear that the entire learning landscape is taking on a new shape: learning situations are diversifying (Figure 1) and digital resources and learning environments have become part of the array (Shear et al., 2011; Norrena & Kankaanranta, 2012). Educators are seeking to determine what skills are needed in the 21st century and what kind of spatial settings best support their achievement (e.g. Fisher, 2005; Lomas & Johnson, 2005; Brown, 2005; JISC, 2006; Oblinger; 2006; Smeds et al., 2010; Mäkitalo-Siegl et al., 2010; Tenno, 2011; Savolainen, 2011; Kuuskorpi, 2012; Kuuskorpi, 2014). When one takes into account the scarcity of resources, advancing tool development, promotional marketing of new devices and issues of

sustainability, the task is not a simple one. However, directions still have to be taken and choices made.

For the time being, the trend is towards mobile tools in the 21st-century student's toolkit (e.g. laptops and tablets) (Pirskanen & Tebest, 2014). In the strategy of the Finnish National Board of Education, one of the points is utilization of information technology in the upper secondary school student assessment and in the matriculation examination (Finnish National Board of Education, 2011). The new mode of taking the exam – scheduled for implementation in 2016 – is pushing schools either to purchase mobile tools for their students, or to ensure by then that, one way of another, they are available to students. The situation in 2014 varies from school to school and may, in the worst-case scenario, jeopardize equal opportunities among students (Pirskanen, 2014).

In the redevelopment of learning spaces, a key question is to ask what learning is essentially about, and in which way, if any, the learning of 21st-century students differs from that of previous generations. From an ecological viewpoint (e.g. Vesisenaho & Dillon, 2013), subjective experience can be seen as the interface between a person and the rest of the world: people learn in their life situations (e.g. Kolb, 1983; Malpas, 2002; Turner, 2003; Roth & Jornet, 2014), independent of whether they are in natural settings or in IT-enhanced ones. They interact with the objects of their surroundings, they make use of the information available to them, they communicate and collaborate with other people in their cultural and virtual contexts, and they reflect and update their worldviews and understanding to be able to navigate further in the world.

In this paper, we address learning spaces with the aim of informing spatial designers about the learning space features that are considered important by upper secondary school students in a Finnish regional context. In the following section, we describe a method for mapping the main characteristics of an ideal learning space and make some method-related observations.

Mapping student views on learning spaces

In spring 2014, we conducted an online survey of upper secondary school students *(N* = 1432) from three schools in a Finnish city. The survey was motivated by a redevelopment project of their future school premises. The aim was to inform spatial designers about the students' views on learning spaces and thereby to anchor the design in general design principles and in human factors (e.g. Vitruvius, 1998; Dix, 2003; Gee, 2006) as well as in specific technical requirements (e.g. Stormi, 2010; Törnblom, 2013) and local cultural practices, particularly the perspectives of the spaces' key users – students and teachers.

We designed a questionnaire to assess the various features of learning spaces. Along with classical design principles and design principles for human–computer interaction, we were informed by the results from our preliminary survey of a larger group of upper secondary school students (Lievonen et al., 2014). In that previous survey, informants described the characteristics of an ideal learning space. In the data analysis, we paid particular attention to adjectives such as *good, suitable* and *sufficient,* and to expressions such as *enough, not too (much of) something*. Furthermore, we noted the frequencies of the most commonly used adjectives. With these results we could outline a list of characteristics for further investigation.

Using a three-point scale, the students assessed a number of factors in terms of their positive and negative impact on learning.

In the second survey, three multiple-choice questions were used to assess various characteristics of a learning space and an open question was used for describing characteristics of an inspirational and motivational learning space. First, we sought to capture what characterizes an ideal learning space through a positive lens: the informants assessed a list of 21 characteristics of a learning space in terms of whether or not they supported their learning. In the assessment, a three-point scale was employed (1 = not at all; 2 = to some degree; 3 = to a great degree).

Figure 1. Learning situations differ in terms of space, participants, processes and tools. They include individual work, teacher–student interaction and student–student interaction, group work and one-to-many communication (when the teacher or a student is addressing the whole class).

Similarly, we asked the informants to assess a second list of 19 features using a negative lens, that is, whether or not a particular feature made learning more challenging. This task yielded a characterization of the features from the opposite perspective.

In the next step the informants, using the 21-term list of learning space characteristics, defined what they considered to be the top four characteristics of an ideal learning space. A third ranking list was composed of the individual top-four sets. We then compared the three ranking lists to see if they yielded similar outcomes.

In order to articulate the terms in a way that was more relevant to spatial design, we classified them into four baskets:

- spatial
- sensory
- social
- instrumental

The spatial basket included metric features (e.g. volume, access, route, distance and layout). Air quality, temperature, visibility (lighting) and audibility (soundscape) belonged in the sensory basket. The social basket included teacher–student interaction, instructional methods, group size, number of students in the school, school atmosphere as well as the calm/restlessness and tidiness of the place. The instrumental basket included equipment, the quality and reliability of tools, and practical and ergonomic considerations regarding the desks and chairs.

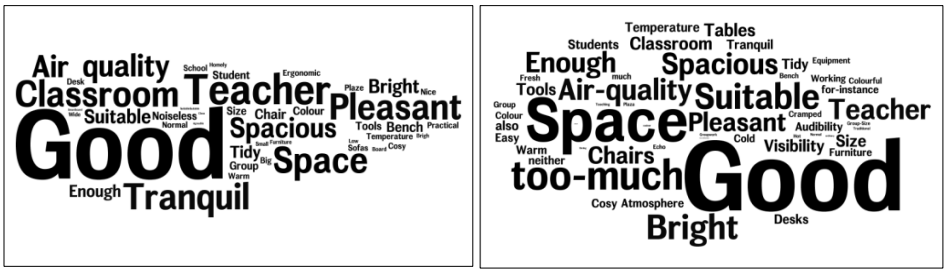

Figure 2. Word clouds of prevalent characteristics of an inspirational and motivational learning space. Left: The most common terms from the male students' descriptions. Right: The most common terms from the female students' descriptions.

Furthermore, the students described an inspirational and motivational learning space in their own words. We combined the individual descriptions into a text corpus and used Wordle to create a word cloud for picking out prevalent terms from their descriptions. Due to the grammar of the Finnish language, however, we first had to edit the text corpus using only the nominative case and either the singular or plural form of the words.

We made separate word clouds of the male students' and the female students' descriptions in order to check for possible gender differences in the descriptions (Figure 2).

We drew on qualitative data to create a polyphonic description of an ideal learning space.

In addition to the above, we coded thematic passages of the informants' descriptions and, drawing on them, created what we called a polyphonic description. In this description we sought to cover, in a rich but systematic way, the main points mentioned by the students. The description included metric and human sensory requirements, a basic concept (i.e. a floor plan), basic requirements for the furniture and tools, instructional methods of preference, expectations for teacher–student interaction and social atmosphere in the class, and general feel-good factors concerning the settings for learning. The polyphonic description provided an additional, ethnographically informed tool that enabled a comparison of the outcomes obtained in multiple ways.

Method-related observations

We used multiple ways to illustrate what features the students considered to be important for a learning space. An overall ranking of the features supporting their learning was created from the data collected through a positive lens, and a second ranking was made based on the data from their top-four choices. An overall ranking list of the factors that complicated their learning was based on the data collected through a negative lens. Aligning the three lists made possible differences visible.

The list we used in the survey for assessing the characteristics of a learning space included different types of phenomena (i.e. physical, functional, perceptual and social). We therefore ended up dividing the terms into four baskets. Another set of illustrations was based on individual baskets (Figure 3). It is easy for a spatial designer to understand a physical classroom, but social features such as teacher–student interaction or instructional methods imply many aspects that go far beyond spatial expertise.

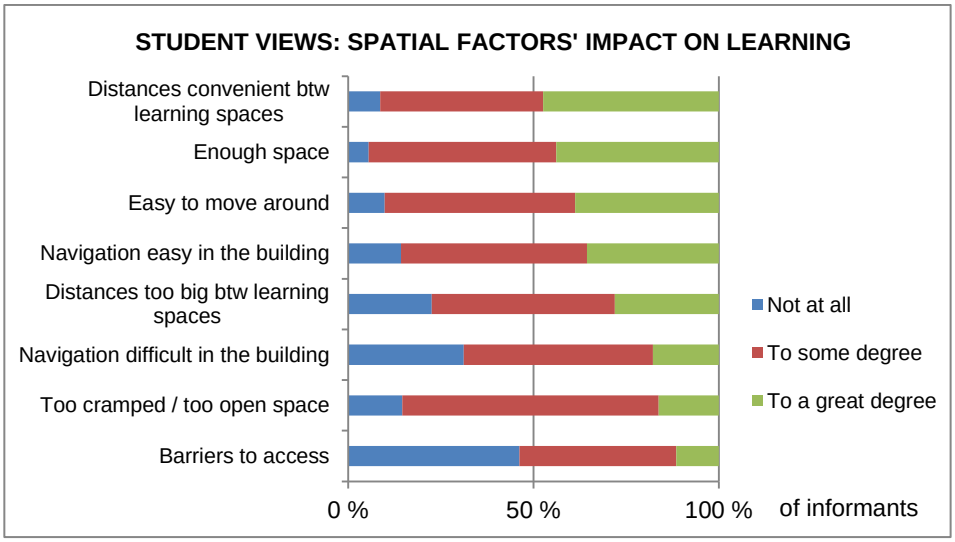

Figure 3. Students' views on spatial factors' impact on their learning.

To take an example, Figure 3 illustrates the students' ranking of spatial factors that impact learning. (The features of the spatial basket at the bottom imply terms such as area/volume, concept, distance, circulation, navigation.) In the students' assessment, *convenient distances* between different learning spaces and *sufficient space* were ranked highest in terms of positive impact on learning. From such cases spatial designers can easily derive user-based design instructions. The case is, however, different when social features are concerned: if the impact of *instructional methods* on learning is ranked highest in that category, how to translate that into spatial terms? In such a case, the

combined expertise of spatial designers, educators and students is required. Instructional methods cover three areas in a communicative situation: distribution of people and objects in the spatial setting, patterns of interaction and tool use. They are therefore a multifaceted issue from the spatial design perspective. Educationalists know the state of the art in their field and survey new research findings, so they can bring wider domain-specific information into the design process. It should also be clarified among the stakeholders where the emphasis lies: on the current users' preferences and the appeal of different methods to users, on the research findings from learning outcomes, or on both. The current informants use the facilities for only three to four years, and the next cohort's practices and preferences may already differ significantly, as can be judged from the rapidly changing trends in, for example, the use of ICT.

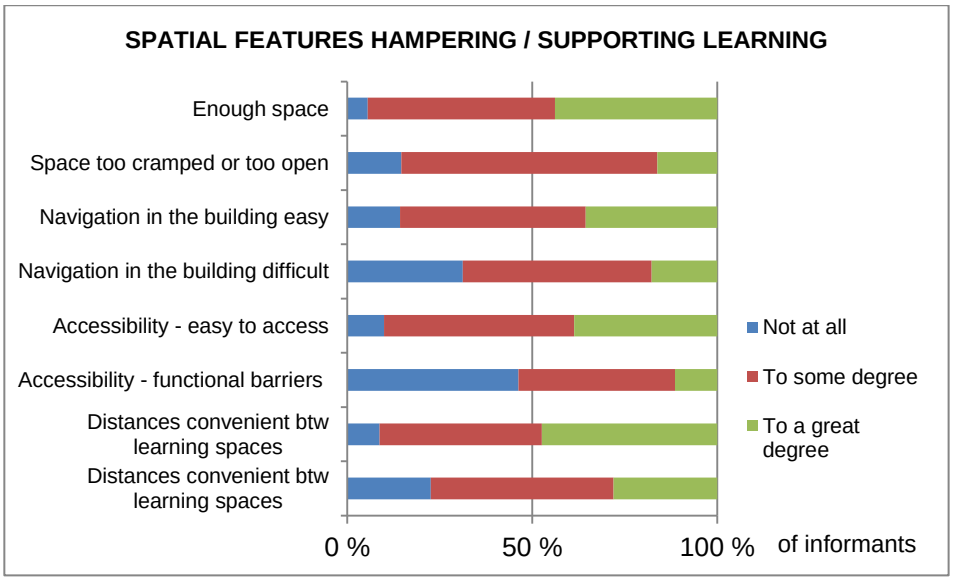

Figure 4 The impact of spatial factors on learning, organized in pairs positive / negative impact. The assessment of the impact on learning was categorically higher through the positive lens than through the negative one.

In Figure 4, we have organized spatial features in pairs in order to make visible possible differences in assessing a factor through a positive lens vs. assessing a factor through a negative lens. Without going further into the results, it is only noted in this paper that the impact of factors on learning was categorically assessed to be greater using the positive lens than when using the negative one.

Two further sets of illustrations were drawn. The first one was gender based. Even though the percentage of male students was much smaller than that of female students (39% vs. 61%) among our informants, we wanted to see if differences appeared between the two sets of data. As mentioned before, we performed a similar check with the data from the verbal descriptions of an inspirational and motivational learning space.

The other set of illustrations was based on different learners. In this set we also wished to show possible differences between learner groups. Because our survey included a question concerning the preferred way of learning (students chose from a list of six options: autonomous study / attending lectures / study in pairs / group work / distance learning / studying in a large group), we were able to draw different group-based preference profiles among the students.

Having collected and analysed our data, it is now possible to make comparisons with recent research literature on the qualitative aspects of learning environments. Currently, a body of research literature is available on technical aspects such as air quality (e.g. Stormi, 2010; Törnblom, 2013), but because human well-being is the topic of the 6th Annual Architectural Research Symposium, we should also point out a study on the significance of aesthetics

for learning environments (Lönnroth, 2014) as well as studies on inquisitive/innovative space (Nevari, 2013; Oksanen & Ståhle, 2013).

Concluding remarks

Multiple perspectives – often conflicting ones – have to be successfully interwoven in order to implement ideal settings for learning. The methodological aim of this paper was to illustrate user requirements for spatial design from the perspective of a particular role, in this case from the student perspective in a Finnish context. As educational systems rely to a great degree on teacher–student interaction, the other role perspective to focus on would be that of the teachers.

Depending on the stakeholder perspective and the level of analysis, the emphasis and granularity change. Spatial design questions that are relevant at the grass-roots level relate to spatial existence, information space, interpersonal communication and interaction, and tool use. Student experience informs spatial design in the contextual factors that are considered to be important by the learners themselves. However, these experiences do not tell us whether or not such settings yield good learning outcomes, too. Each curriculum has particular goals and criteria for learning outcomes. For educational bodies, the effectiveness of the settings in supporting the students' achievements is an important issue; therefore, they closely monitor the outcomes. However, a study on the impact of spatial settings on learning outcomes requires different methods. Facilities management, among other groups, is interested in macro-level issues and indicators. For instance, efficient use of space is among its practical concerns.

Overall, the method we applied in our study has supported the development of a number of user-centred specifications to inform the spatial design of future settings for learning. Based on our experiences, the method appeared to be promising. It would, however, require adjustments in future cases. For instance, more items could be included in the assessment list. In addition, as ICT use diversifies and extends learning situations beyond school buildings, spatial navigation, spatial control, interpersonal communication and collaboration have to be considered in the much more complicated condition of hybridization. Another interesting direction would be to apply the same method to learning environments in different countries as well as in different educational and cultural contexts in order to gain commensurate data on student perceptions of the criteria for ideal learning spaces.

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