

Collaborative design of an active learning classroom with high school students and teachers

Collaborative
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learning
classroom

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Abstract

Purpose – The aim of this study is to understand classroom settings desired by high school students and teachers in an active learning classroom. The research question is whether students and teachers will differ from each other when designing an active learning classroom.

Design/methodology/approach – In an effort to design a learning environment for an advanced placement programme, action research methodology was followed by conducting a participatory workshop in a real active learning classroom with future users. Working in isolation from one another, students and teachers designed their own classrooms by forming different learning centres. During the study, two groups, made up of ten high school students and seven teachers, respectively, were asked to arrange the furniture in an active learning classroom. The groups were free to form as many furniture arrangement configurations as they wished and were asked to write about their workshop experiences afterwards. Once they had completed both tasks, their plan layouts were examined.

Findings – All of the plan layouts were found to fall into one of three categories: a traditional layout, a small group layout or a single large group layout. The written texts were also analysed, which revealed different perspectives of each participating group. As students and teachers explore different learning opportunities, they appear to be driven by different kinds of experiences when they endeavour to organize their classrooms.

Originality/value – Never before has an active learning classroom been the site for a participatory furniture arrangement workshop that employs teachers and students.

Keywords Collaborative design, Learning centres, Active learning, Furniture arrangement, Classroom

Paper type Research paper

Introduction

Understanding the new generation of students and ascertaining how the particular features of this generation may shape the development of student-centred facilities has been a major concern for administrators, architects and designers alike (Ruffo, 2008). According to Flynn and Vredevoogd (2010), the education in the future will enable students to make decisions about their learning experiences. However, the needs and expectations of students at present are not met by their learning environments (Weinstein, 1979; Ghaziani, 2008; Scott-Webber, 2010; Kepez, 2018).

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Presented study is an effort to design a unique learning environment for an advanced placement programme by involving high school teachers and students who will be the daily users of this classroom. In order to fully understand their effort and self-reports in a furniture arrangement workshop, first, we will report the background on classroom arrangements and seat preferences of the learning community, privacy needs in the classroom and the growing literature on active learning.

Classroom arrangements and seat preferences of the learning community

In one of the earliest studies of the relationship between classroom arrangement and interaction, [Becker *et al.* \(1973\)](#) found that both teachers and students were very much resistant to changes in their classroom habits.

Having implemented three different furniture arrangements in an English as a Foreign Language (EFL) classroom – namely, a split-half format, an arrangement incorporating groups and pairs and a layout suitable for lectures – [Jackson \(2009\)](#) concluded that teachers and students preferred different kinds of configurations.

Most of the early research on classroom furniture investigated the effects of students' seat selection on their performance and arrived at quite varied findings. Several studies claimed that students who sit closer to the front of the class gain better grades compared to those who sit at the back ([Perkins and Wieman, 2005](#); [Gossard *et al.*, 2006](#); [Benedict and Hoag, 2004](#)). In contrast, a number of studies have suggested that seat location has no impact on success ([Kalinowski and Taper, 2007](#); [Armstrong and Chang, 2007](#)).

The studies mentioned earlier and others like them were conducted in traditional classrooms; that is, in settings where the seats were fixed, making it easy to define the front of a classroom. One critique of the traditional classroom has emphasized that the traditional rows of seating convey the message that the teacher standing in front of the class is the transmitter of knowledge for that class and as such, serves as the primary focus ([Sanoff, 2009](#); [Garret, 2014](#)). Although this type of configuration makes it easier for teachers to move around and monitor whether students are paying attention to the lecture, it has many disadvantages for students. They are not able to work in groups with ease, face difficulties seeing each other during group discussions and may also find it hard to hear the teacher and other students ([Garrett, 2014](#)). However, in conceptualizing students as passive responders who are bound to study in classrooms with fixed seating arrangements, such studies do not do justice to the complexity of learning processes and associated classroom ecologies.

To be sure, a limited number of studies have examined classrooms with different plan layouts and traced their effect on the learning outcomes. [Solomon and Kendall \(1975\)](#) observed six different classrooms – three representing relatively open classrooms, and three others representing relatively traditional classrooms – and found that the teachers' discipline and criticism scores were significantly higher in the traditional than in the open classrooms. [Marx, Fuhrer and Hartig \(1999\)](#) compared question-asking behaviour of students in a semi-circle with that in traditional settings (i.e. divided up into rows and columns) and found that students asked significantly more questions in the semi-circle setting. In research conducted in two different kinds of classrooms – a traditional lecture hall and a studio style classroom – [Kregenow *et al.* \(2011\)](#) concluded that the students who gained higher course grades tended to be those who sat at the front of a lecture hall; when it came to a studio-type classroom, on the other hand, no such pattern could be discerned in the course grades.

[Silberman \(1996\)](#) differentiated between ten different types of classrooms based on particular furniture configurations, each of which was more suitable for a certain type of learning experience. [Dyck \(1994\)](#) studied learning centres that may be a part of a classroom and identified the fat-L shape as the most effective design due to the range of behaviour settings it supports. [Lippman \(2004\)](#), however, claimed that the L-shaped classrooms were

more suitable for project-based learning since they offered flexible, variable and integrated learning centres. When [Sanoff \(2009\)](#) presented six different classroom layouts in a participatory workshop conducted with teachers, they selected the *L*-plan type, praising it for the flexibility it offered in terms of managing the space and setting up learning centres. Based on her teaching experience in a traditional classroom setting in faculty of architecture, [Topcu \(2013\)](#) proposed that transforming the classroom to a more dynamic and flexible learning environment would also increase student engagement. [Parsons \(2017\)](#) found that when tables are grouped to make a circle, the overall interaction of the class increases due to the increased visibility, which empowers students to regulate discussions and enables active participation.

Privacy needs in a classroom setting

In order to negotiate their social contact within the physical environment, students seek to control their interpersonal boundaries ([Sommer, 1969, 2002](#); [Gifford, 2007](#)). [Ahrentzen and Evans \(1984\)](#) studied classrooms with and without secluded private areas for students and surprisingly found that students in classrooms with amenities for private study reported lower levels of privacy. They concluded that classrooms with dedicated private study areas are perceived as failing to provide students with genuinely private areas when needed. [Pedersen \(1994\)](#) studied a rectangular classroom and described seat locations according to their position within the classroom. The researcher concluded that students who sat at the back enjoyed the privacy they craved for significantly more than the other two groups sitting at the front or in the middle. [Kaya and Burgess \(2007\)](#) researched the territoriality behaviour of students, based on their seat selection in different types of classrooms. They found that students with a stronger preference for privacy did indeed prefer to sit in certain seats. However, they also found that cluster- and *U*-shaped layouts served to eliminate differences in privacy among students.

Active learning environment and its outcomes

[Scott-Webber \(2012\)](#) argued that the conventional “industrial” model of education, involving a passive learning approach, failed to address what the students would need for future success. Correspondingly, classroom design needed to be transformed from “a row by column” seating arrangement into a much more versatile design of learning spaces that supported new forms of learning ([Scott-Webber, 2012](#)). This type of classroom layout also called for the application of new pedagogies, which encouraged students to be active participants in the classroom. This new approach, often referred to as “active learning”, helps students to carry out meaningful learning activities and think about what they are doing ([Bonwell and Eison, 1991](#)). [Prince \(2004\)](#) has defined active learning as any instructional method, the core elements in which are student activity and engagement in the learning process. [Sgambi et al. \(2019\)](#) showed that active learning pedagogy can promote students’ creativity and critical thinking when applied to college courses (in their case a structural design course) that are conducted in a passive way.

The work of [Scott-Webber et al. \(2013\)](#), which was conducted at three US higher education institutions, indicated that in comparison to traditional classrooms, the rates of participation, co-working and in-class interaction were a good deal higher in active learning classrooms (ALC). [Clinton and Wilson \(2019\)](#) compared collaborative learning of students in a traditional classroom with an ALC and found that collaborative learning was better facilitated by the design of the ALC, making it a more enjoyable experience. According to [Nissim et al. \(2016\)](#), both teachers and students reported better outcomes when they taught and learned in ALCs. An empirical two-year study of 306 courses and 35,000 units of student perception data revealed that, compared to traditional classrooms, ALCs are better learning environments for nurturing innovation for all students regardless of their academic ability ([Chiu and Cheng, 2017](#)). Relying on observational study, [Johnson et al. \(2018\)](#) found that ALCs encouraged more frequent and better student–

instructor and student–peer interaction. They also found that, in ALCs, the time spent on instructor-led examples decreased while the time devoted to active learning increased. [Talbert and Mor-Avi \(2019\)](#) combed through 37 articles on active learning environments published since 2004, but did not list any studies done with high school students and teachers. Thus, the present study fills a gap in the literature by involving the high school learning community. It is evident that from early age, the quality of school environments effects children’s physical and cognitive development, mechanism of perception and behaviour ([Turel and Gur, 2019](#)). In our case, same is true for active learning environments and the learning community involved.

From this review of the literature, it should be clear that classroom design is an important component of learning experience; and there’s more research needed *in active learning environments* considering *the positive outcomes*.

Theoretical background

[Barker \(1968\)](#) stated that the environment plays an important role in shaping people’s behaviours. Applying Barker’s behaviour settings theory to learning environments, one would assume that different classroom configurations lead to different in-class behaviours.

The notion of “affordance”, a term coined by [Gibson \(1979\)](#) to describe environmental features that prompt particular behaviours, lends itself to the theoretical basis of the current study. According to Gibson’s theory of affordance ([1979](#)), through its features, an environment may encourage particular behaviours; and these features can and should be traced within the environment. When a pattern emerges among these behaviours, it can be said that a “behaviour setting” has come into being ([Barker, 1968](#)). [Norman \(2013\)](#) broadened the theory of affordance to the field of industrial and service design. Recently, there has been an adoption of this theory as a theoretical base to study ALCs. [Rands and Gansemer-Topf \(2017\)](#) employed the theory of affordance to understand ALC and the behaviours of the learning community. [Bork et al. \(2018\)](#) also stated the flexibility of classrooms as an instructional affordance leading to active learning pedagogy.

Classroom environments can be studied as a combination of such small-scale environments, which various scholars have termed “learning centres” ([Dyck, 1994](#); [Lippman, 2004, 2010](#); [Sanoff, 2009](#); [Salama, 2009](#)). In a classroom, learning centres can be easily identified by the environmental features they possess. Thus, in a classroom environment, learning centres are behavioural settings that encourage particular in-class behaviours, including social interactions among peers and between students and teachers.

Research question

As a qualitative and exploratory inquiry, this research does not pursue a test of hypothesis. The research question of this study is whether students and teachers will differ from each other when designing an ALC. Indeed, based on the literature review, it’s evident that differences between students’ and teachers’ classroom preferences are expected, especially when the environment supports various learning opportunities. Following the main research question, the secondary research question is as follows:

RQs. What are the motivations of teachers and students while organizing their own classroom?

Methodology

Participatory design is a type of action research where different user groups are empowered by game-like instruments to make complex design decisions. Thus, the following methodology can be best described as a form of “action research” in which the research is designed in the course of the collaborative exploration of community needs ([Zeisel, 1993](#); [Groat and Wang, 2002](#)).

The principle underlying community design is that when laypeople are provided with adequate information on the costs and benefits of design decisions, they can make meaningful choices for their communities (Sanoff, 2000, 2010). This process of obtaining valuable design information from the community is often called a “community design workshop”, which tends to be custom-designed for the community in question. Board games, 3D models, 1–1 scale mock-ups and virtual environments are counted as mediums for participatory design workshops or events that used to be employed primarily for learning purposes (Sanoff, 1994, 2000; 2010; Salama, 2009).

The context, the participants and the flow of the workshop

The workshop employed in this study was designed to be carried out among high school students and teachers in a real-life setting, namely an active learning centre. The concept of ALC was initially developed to overcome problems associated with large enrolment courses (Beichner *et al.*, 2007). Following this approach, classes would be divided into smaller groups of between 25 and 30 students, each of which was to be led by a teacher (Baepler *et al.*, 2014). Thus, the ideal unit for an active learning community is a group not larger than 25, that is, the capacity of the context studied in this article.

The venue under consideration is a state-of-the-art active learning environment, consisting of a classroom furnished with moveable furniture. The space offers numerous arrangement choices for seating. The walls are covered with ceramic-steel surfaces, which are used as screens for projection, “boards” for writing on and magnet-notice boards for attaching and exhibiting posters and other visual materials. To enable optimal user control, the classroom has independently operable lights, HVAC and windows. To enable laptops and other electronic devices to be used with ease, there are several electrical sockets around the room, including some on the floor. Thanks to these features, each of the seats in this ALC has the potential to be a “preferred seat” for a student. Moreover, the configuration of the furniture within the space can be changed in a matter of minutes in order to satisfy the needs of all types of different classes. All features of the ALC are affordances for formation of learning centres (Kepez, 2018).

The participants in the workshop where the data for the present study were collected were ten high school students and seven teachers from the same high school, which offers an advanced placement (AP) programme (CollegeBoard, 2017). Two of the teachers taught English as a Foreign Language; and each of the other teachers had a different specialization, namely math, science, social sciences, literature and computer science. The participants were genuinely interested in transforming some of the classrooms at their school for AP programmes. In these programmes, students are introduced to the notion of self-study and how it can be applied within their interest areas (math, science, arts and humanities). They are then expected to work side by side in the same class, regardless of their areas of specialization (CollegeBoard, 2017). In this way, they form a learning community with diverse interests, but they are expected to collaborate during their learning processes. Thus, AP classes are not like traditional classes, but consist of situations that are unusual for teachers and students alike.

After gaining approval from the Institutional Review Board (IRB), the researchers planned a trip for participants to the Steelcase Active Learning Center at KHAS where the workshop was due to be held. Participants were first introduced to the features of the active learning classroom (ALC) and were encouraged to acquaint themselves with them as much as they could. Then, they were asked to design their own classrooms; and it was pointed out that they were free to make as many as configurations as they wanted. Both groups were also told that we were not interested in the number of configurations they made, but rather we wanted to learn about their motivations for arranging a classroom in a specific way. A random choice

was made to start with the teacher group, and the student group was taken outside to free the room for the teachers.

Both groups started their turns with a configuration that was somewhat similar to a semi-circle or U-shaped classroom configuration, a configuration that invited both groups to explore new possibilities. It should be stressed that the two groups worked in isolation from one another; and neither group was informed about the configurations designed by the other. A researcher remained in the classroom to answer any questions the participants may raise and documented the whole process by taking notes and photos. However, to ensure the natural flow of this workshop, no video or voice recordings were made. Once the students had completed their turn, both groups were asked to write about their experiences during the workshop.

Analysis of workshop output

As the first step in the analysis of the classroom layouts created by the groups, using the photos taken during the workshop, we classified the distinct furniture arrangements in the classroom. After that, the configurations that these designs represented were identified and digitized. Once we had drawn up plans of the classroom showing the arrangements, a panel of independent experts examined the learning centres that could be present in the plan layouts. Also participants’ handwritten, open-ended comments about the workshop were typed up; and a content analysis was conducted to understand the differences in preferences of the student and teacher groups.

Analysis of classroom layouts and furniture configurations

In their arrangements of the furniture, the teachers produced five, and students produced six classroom layouts, respectively. A review of the classroom layouts reveals that they all fall into one of the following three categories: traditional layouts, layouts made up of small groups and layouts that contain a single large group. Furniture configurations constituting traditional classroom layouts are easy to recognize: they consist of regular rows of tables and chairs, mostly facing the teacher’s desk (Figures 1 and 2). Such layouts were preferred twice by the teachers and once by the students. In their written comments, the teachers mentioned

Plate 1.
Furniture
arrangements in
traditional
configuration made by
teachers (1,2) and
students (3)



Plate 2.
Furniture
arrangements in small
groups configuration
made by teachers (1,2)
and students (3)



that they wanted to see what a traditional classroom would “feel like” with the given furniture, whereas the students stated the need to have at least one setting for “exams”, which, many of them felt, was an “unavoidable fact” in learning (Plate 1).

Both participating groups produced at least one furniture configuration based on small groups. Among the six furniture configurations produced by students, there was one classroom design for small groups of three to six participants. Teachers, however, designed two out of their five classroom layouts to accommodate small groups of three to six. The teachers opted for the small groups’ design more often since they favoured their practical use in line with some of the goals of the curriculum and materials associated with it. In fact, both groups mentioned that they sometimes arrange their regular classrooms for group studies but pointed out that doing so is troublesome with traditional furniture, which is not easily moveable (Plate 2).

A third type of furniture configuration presented itself, which can best be described as a “single large group” design. This large group was sometimes accompanied by smaller groups and sometimes by individual chairs. Whereas the teachers’ arrangements included just one pattern of this kind, the students’ included four. By teachers and students alike, the centre of the classroom was used to accommodate a large group, with smaller groups scattered around. In the teachers’ sole classroom arrangement of this kind, there was one chair in the middle of the circle, possibly reserved for a presenter, but in the four furniture configurations prepared by the students, there was no identifiable dedicated seating for a presenter (Plate 3).

The ALC used for both workshops contained a desk for the presenter. Although the participants were told that they could remove any furniture they did not want in the room, neither of the groups took this desk out of the room; in fact, they did not even move it away from the corner in which it was originally positioned. It appears that the presence of a desk dedicated to the teacher made the wall behind the said desk look like a wall for presentations although all four walls of the room could be used for this purpose.

In four of the five configurations that the teachers made, this wall remained unblocked: it was retained as a surface designated for use by the instructor and was kept clear of any posters, writing and so on. In contrast, in only half of the six configurations produced by the students did this wall receive such privileged “protection”; in the other three configurations, it was treated the same as the other writing surfaces. Thus, it can be concluded that a dedicated



Plate 3.
Furniture
arrangements in single
large group
configuration made by
teachers (1) and
students (2,3,4,5)

spot for teachers limits the use of that location in the classroom, even when the associated furniture is moveable.

Analysis of the open-ended reflections

The collected open-ended reflections offered us rich insight into the underlying thoughts of participants. A panel of experts read these reflections to identify information that could be compared with the results of the analysis of the plan layouts. Each participant was given a code (*T* for teachers and *S* for students) to identify the group to which they belonged, as well as a number to anonymize their name (eg. [S1]: student with the ID number 1). The themes that emerged from the content analysis are listed in [Table 1](#) along with selected comments from the participants. These are views on traditional classrooms, a comparison of ALC traditional classrooms, the flexibility of ALC, the wall-to-wall board system, appropriateness of ALC for different activities, achieved privacy and single large group design.

Views on the traditional classroom. In the reflections they penned, the students shared their negative views of the traditional classroom. They also mentioned how traditional education and the corresponding classroom environment affect creativity.

Comparing the ALC to traditional classrooms, students felt as if in the former, they had control over the classroom environment and the class. Similarly, teachers agreed that the design of ALC makes them more active and allows them to move around the classroom.

Having completed the furniture arrangement workshop, both participating groups praised the flexibility of the ALC. They liked how easy it was to change the location of the furniture; and they enjoyed the time they spent exploring different configurations. They compared the pleasure of this experience with their earlier not-so-enjoyable experience of moving furniture around in traditional classrooms.

The perceived flexibility of the classroom derives not just from the moveable furniture but also from the wall-to-wall board system that is well-suited for writing, for projecting and for hanging up posters using magnets. Both groups liked these features and reported the contribution they made to the flexibility of the classroom.

Views on the appropriateness of ALC for different activities. Students experienced that the “learning goal” can shape the classroom and appreciated that the space can be used effectively for all types of classes. They mentioned that the very activity of reshaping the classroom for a given task may increase the activity level of the students.

The teachers described the changeability of the classroom as functionally beneficial and time-saving. Their experimentation with the classroom features allowed them to perceive each and every configuration they made as equally good as any other configuration, since it was so easy to switch between them when the class activity so required.

Views on the privacy achieved in ALC. Students experienced that the classroom design allows them not only to work collaboratively but also to work alone. As a matter of fact, the analysis of open-ended responses revealed that several students mentioned the importance of their privacy in the classroom. They believed that the need for private study areas in the classroom was one of the basic needs for their generation. While working on the classroom configurations, they tried to maintain their need for privacy by designing small groups like satellites appended to a single large group. It is a striking fact that none of the teachers mentioned anything about privacy.

Views on the single large group design. Students also reported other factors that motivated them to design a single large group configuration. One was that the high visibility provided by a single large group makes social interaction easy. Furthermore, single large groups designed by students were surrounded by smaller groups that varied considerably in size; apparently, this did not create any crowding issues and was found to be convenient.

Themes emerged from content analysis	Selected comments
Traditional classrooms	[S1] "Studying at a school that is designed with a traditional understanding of education is not very appealing." [S2] "The fact that in traditional classrooms the place of all items are fixed and unchangeable is a feature that dulls creativity."
Comparison of ALC with traditional classroom	[S10] "The comfortable and modern space puts people first and increases interactive learning. It does not feel like the lesson is imposed upon the student, it feels like the student could control the lesson." [T7] "It is a nice and useful feature that the teacher does not have to be at a single designated spot. . ."
Flexibility of the ALC	[T3] "It is a great benefit that it [the class] is very mobile." [S2] "I like the mobility of the class." [S1] "The fact that the desk and chairs can be moved easily is a great advantage. It [moving furniture] takes too much time when the desks and chairs do not have wheels." [T7] "I could never have guessed it would be this easy to change the seating arrangement. Not only is it easy but also the act of changing the seating is fun." [S10] "A versatile and fresh workspace. The movement of the furniture eliminates the feeling of being trapped."
How the wall-to-wall board system enhances the versatility of the ALC	[S7] "The extremely functional use of walls makes the space efficient." [S2] "One other feature I like about the class is that almost all walls can function as a [writing] board." [S10] "It is perfect that all walls are [writing] boards, it is as if the walls are saying "Come on, join us" or "Do you have an idea, WRITE IT!" It is a great method to mobilize the student." [T3] "Having all of the technology [referring to multi-functional writing boards] within the same space provides ease and freedom."
Appropriateness of ALC for different activities	[S1] "It is great that the class is not thought of as a single model but changes shape in accordance with the given task. . .The possibility of using different configurations is a feature that can increase the activity level of the class." [S5] "The fact that the class can be modified not only for social-studies classes but for all sorts of classes is very practical." [S9] "Thanks to the mobility of the class, several different activities can be carried out. Creating a class setting or a debate setting does not take as much time as it does in normal classes." [T1] "The different class settings I organized with my friends have shown that this classroom can be used functionally in many ways." [T4] "It is very impressive that you can change the setting in such a short period in accordance with the teaching method. Most important of all with respect to time management is that it allows the redeployment of the area for different activities within a very short time." [T7] "I cannot pick a favourite model, because the ability to adapt [the room] as I like depending on the topic and lesson is the greatest feature."

(continued)

Table 1.
Themes that emerged
from the content
analysis and selected
comments from the
participants

Themes emerged from content analysis	Selected comments
Privacy achieved in ALC	[S7] “This classroom, being a spacious, simple, convenient and most importantly mobile and easy to change space, gives people the opportunity to discuss, communicate and, when necessary, to work on one’s own and most importantly to produce.” [S8] “Although we are together in class, there is a place where everyone can act as an individual and design the best learning style for themselves. . . . It is very clear that this classroom is designed by people who are well aware that we are a new and different generation. The classroom has a structure that allows everyone to act as individuals, design the best learning style for him/herself although we are all together in the same class.” [S1] “I think the classroom model where everybody had their own work-space that looked out to the sides of the class was good. The students could work without being influenced by anyone in an environment which was not cluttered with too much furniture.”
Single large group design	[S4] “The shape I liked most was the one with the large table in the middle and other small groups made up of smaller tables. What I like about this design is that students have spaces assigned to themselves.” [S1] “The hexagonal class model is ideal. . . .All students can see each other, and this increases motivation.” [S2] “Among the classroom settings we created, the one I liked best was the last one, the hexagonal one. This way it is possible to do group work in groups larger than two or three people.” [S6] “With this interactive exercise we have created several learning spaces. These spaces ranged from ones that allowed group work to ones that focus more on social interaction. The most beneficial and comfortable among these designs was the first one (a single large group with smaller groups surrounding it).” [S10] “The ideas of a hexagonal design or one with extensive space between the tables were fun, and they allowed easy access to and exit from the space.”

Table 1.

In the analysis of the plan layouts, what emerged as an original classroom configuration was a single large group surrounded by smaller groups; to the best of our knowledge, such a configuration is not cited in the literature.

General evaluation and discussion

In the learning environment in which the workshop was held, different configurations defined different types of learning centres. Considering both configurations produced and texts written by each group, one can say that participants’ past spatial experiences played an important role in their decision-making (Figure 1). We knew that the participants only used traditional classrooms until this workshop. Thus, their experience in an active learning environment is affected by their past experiences to the point where they start exploring new opportunities. From this perspective, students are more into discovering new furniture configurations as they have less spatial experience and are thus more open to new experiences than their teachers. Students are also less bound by the limitations of traditional pedagogies followed to cover expectations of the national teaching system.

Flexible space can pave the way to the creation of dynamic (Figure 2). learning centres that are not only in harmony with the pedagogies to be followed but are also sensitive to the

Collaborative design of active learning classroom

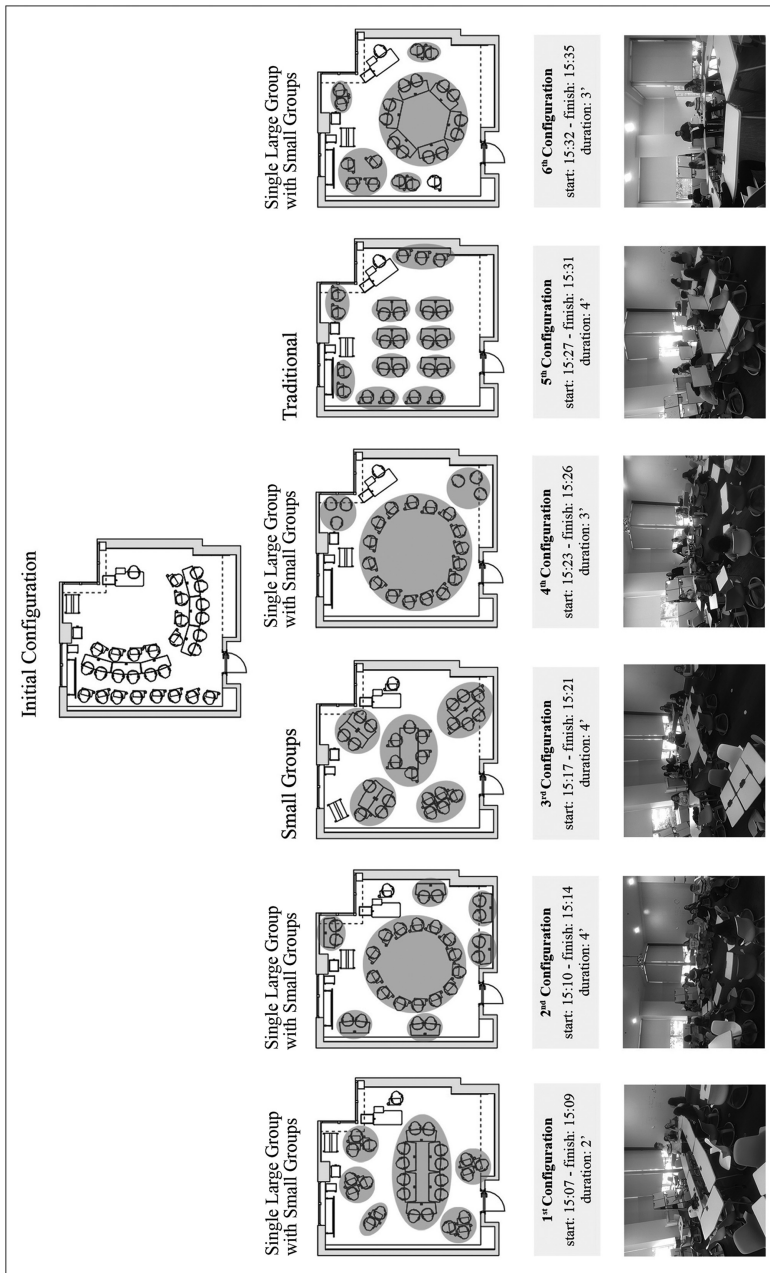


Figure 1.
Classroom layouts
produced by students

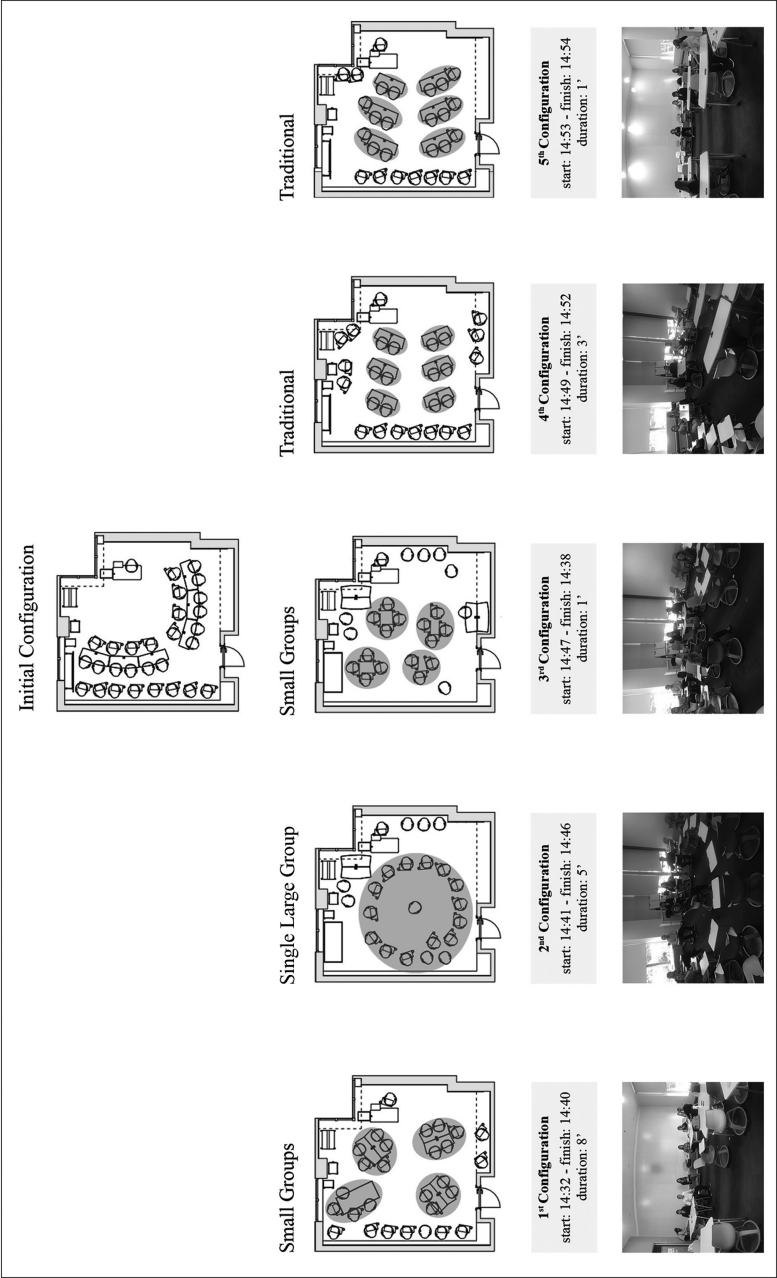


Figure 2.
Classroom layouts
produced by teachers

behavioural needs of users, privacy included. In all of their configurations except for the traditional one, students sought to enable different levels of privacy within the classroom (Figure 3). Thus, a student could be a part of the whole class, a member of a small group or an individual in isolation. This study revealed a new type of classroom layout; it introduced a single large group where students would have the opportunity to sit around closed forms (rectangular, circular, hexagonal), providing maximum visibility of other members of the learning community. U-shaped and semi-circular arrangements have been praised elsewhere for the benefits they furnish in increasing social interaction (Hurt *et al.*, 1978; Marx *et al.*, 1999). Both of these forms assign a distinct place to the instructor, which is mostly combined with rows of seating that are somewhat similar to the traditional configurations. However, the students in this study generated entirely closed forms, eliminating the place reserved for the instructor, always using a single row of seating to define a boundary. Accompanied by smaller groups of different sizes, this configuration made possible alternative learning centres for individuals, featuring different levels of privacy. This may also be the reason why the student group chose to design four of their six classroom configurations as a single large group. The teachers' sole large group retained a presenter in the middle, without signalling the presence of small groups. This design underlines the difference between the teacher and the students, but it also places limits on the authority of the teacher by controlling visibility.

In the teachers' workshop, some chairs were placed arbitrarily, as if they were left in the room without any particular purpose. Based on the notes taken during the workshop, it can be surmised that some furniture was intentionally left standing around when a representative configuration was made. Moving on from this observation, we would suggest that in future studies of this kind, "furniture" should be limited to chairs and tables, that is, the basic elements of learning environments; and participants should be instructed to make use of all the items.

Conclusion

Echoing former studies that explored the effectiveness of the learning environment (Temple, 2008; Nissim *et al.*, 2016), flexibility stands out as the main feature of the active learning space in which this study was conducted. The results indicate that the students and the teachers organized the classroom based on their different experiences during the workshop. The teachers developed traditional layouts and proposed new configurations based on small groups that resemble the way they make groups in their current classrooms. However, the students designed only one traditional layout for exams and tried to come up with entirely new configurations by including a single large group accompanied by smaller groups. Thus, the students' efforts went beyond creating traditional classroom configurations and demonstrated that active learning environments can be transformed to accommodate different levels of privacy when needed. Judging from the configurations designed by the students, it is also possible to conclude that they do not see themselves as fixed to chairs, but

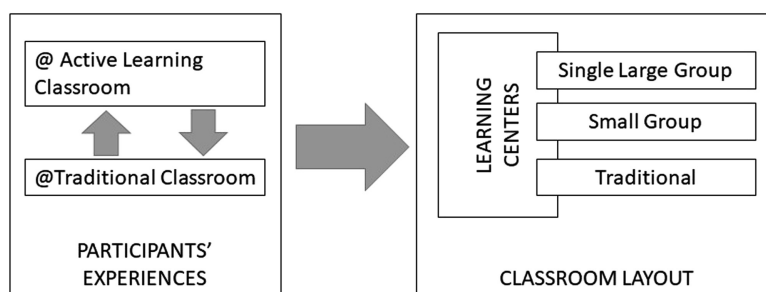


Figure 3.
Relationship between
participants'
experiences and the
classroom layouts they
produced

imagine themselves moving around the classroom. In this workshop, students' preferences relied on the new experiences they would like to have and the levels of privacy they desire rather than the traditional activities they experienced and the given privacy levels.

Finally, it should be emphasized that an active learning space is something much more than simply eye-pleasing furniture and cool multi-functional walls. It is a space that works best when active learning pedagogy is combined with the possibilities provided by the furniture configurations. Such a combination will empower learning communities to explore new possibilities. That said, the furniture arrangement workshop we conducted was found to be an effective way to engage communities to rethink their learning environments. It is a challenge to make spatial and curricular transformation in communities so that active learning can be promoted. Thus, in conjunction with other participatory design strategies, workshops like the one we conducted can be used to trigger cultural change in learning communities. Implications of findings of this research are threefold. First, design practice on active learning environments can benefit extensively from the configurations of furniture designed by the learning community in this research. Second, the design of this workshop is also applicable to other learning environments. Third and last, application of similar studies in different contexts may serve as a knowledge base for an in-depth understanding of cross-cultural differences of the learning community. Our future efforts will incorporate randomized participant groups with objective analysis tools for their observation in different contexts continuing our enthusiasm to design for better outcomes.

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