UNDERSTANDING STUDENTS' PREFERENCES OF COMMON SPACES FROM A PHYSICAL AND PSYCHOLOGICAL PERSPECTIVE

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ABSTRACT

Although common spaces in a university can serve an important role for adolescents in learning with colleagues and developing their ideas, common spaces have received insufficient research attention. Therefore, this study identified the characteristics of physical environments that promote active leaning among university students and the psychological aspects of students' modes of being in common spaces. We conducted an online questionnaire and analyzed the data (N = 144; 86 men and 58 women; mean age = 23.5 ± 5.8 years) using cluster analysis and text-mining. We revealed three types of physical characteristics that promote students' active learning and five groups of students' modes of being in common spaces. The physical and psychological characteristics of the common spaces that promote active learning are discussed.

Keywords: Common Space in university; students' perspective; physical and psychological factors; active leaning.

INTRODUCTION

Students' learning is deeply related to or embedded in their environment. Students' behavior is formed by environmental aspects such as lights, sound, furniture, or materials in the environment, and students can change their moods and behaviors by adjusting aspects of their environmental. In this sense, understanding the relationships between students' learning and the environment is an important research issue (Stedman, 2003).

In Japan, some universities have started to create learning commons since the 2000s (Ishiguro et al., 2018). Learning commons were established along with a paradigm shift in higher education from teacher-centered passive learning to student-centered active learning (Bonnand & Donahue, 2010; Okuda, 2012). Learning commons are often located in libraries and are also called "information commons" or "commons space." There is no widely accepted definition; however, the consistent word used is "commons," which "originally referred to land or public space that was shared in common" (Bonnand & Donahue, 2010, p230). The object of this study is indoor common spaces, which are not limited to libraries, as common spaces can also be located in cafeterias, dormitories, student unions, or outdoor spaces to facilitate students' social interactions and learning (Halsband, 2005; Peker & Ataöv, 2020). Common spaces are the foundation for social interaction (Carnell, 2017), which promotes learning and can serve an important role for adolescents to collaborate with colleagues and develop their ideas.

However, some studies have revealed that common spaces in universities do not work well. There is a critique that common spaces do not change students' way of learning (Okuda, 2012). Previous studies investigating students' utilization of common spaces suggested that students use the space alone to prepare for lessons and have little opportunity for group discussions (Ishiguro et al., 2018). Although universities have tried to create a place for interaction aiming at active learning, students' communication was insufficient. Thus, it is necessary to clarify what physical characteristics of a common space promote communication and how students would like to spend their time in a common space.

Therefore, this study explored what kinds of common spaces encourage university students' active leaning from physical and psychological perspectives. We examined what physical characteristics promote students' active learning and the students expect to spend their time in common spaces.

PREVIOUS STUDIES

Physical Aspects of Common Spaces

Referring to previous studies (Douglas & Gifford, 2001); Lau et al., 2014); Peker & Ataöv, 2020), this study focused on four physical characteristics of common spaces: color tone, flexibility of body and furniture movement, materials, and view of the outdoors. Generally speaking, color tones affect the atmosphere of a room and students' recognition, emotions, and behaviors (Elliot & Maier, 2014). While

it is well known that cool colors have a calming effect and warm colors create warmth and excitement (Davarpanah, 2017), it has been demonstrated that both colors have positive effects on performance: red enhances performance on detail-oriented tasks and blue enhances performance on creative tasks (Mehta & Zhu, 2009). This means that both color tones are important, and we often combine both cool and warm colors in everyday life. Therefore, we will combine color variants using a color wheel diagram and examine students' preferences of color combinations. Flexibility of body and furniture movement can promote students to be productive. Previous studies noted that students preferred modern mobile chairs and trapezoid tables with chairs on casters, which were comfortable and promoted learning engagement and interactivity, while traditional tablet armchairs and fixed tiered seating with tablet arms were less preferred (Harvey & Kenyon, 2013). Additionally, flexibility and openness promote creating a community, allow for holistic learning, and encourage student engagement in learning (Rands & Gansemer, 2017). This study focused on flexibility—that is, how students can move freely owing to the furniture arrangement.

Material selection, including texture details in interior design, is expected to impact adolescents' skills and emotions (Davies et al., 2013). Previous studies found that Japanese cedar rooms reduce a person's blood pressure, which makes them more comfortable compared to rooms with artificial materials. This may indicate that wooden interior materials have a positive or neutral effect on the quality of the indoor environment (Sun et al., 2020; Alapieti et al., 2020). This study focused on the impact of natural and artificial materials on students' behavior.

View of the outdoors can also play a role in reducing students' stress. Joye (2007) stated that humans are aesthetically attracted to natural contents and particular landscape configurations, and these features positively affect human functioning and reduce stress. Outdoor spaces (especially green spaces) have shown positive effects both scholastically and socially (Lau et al., 2014; Manca et al., 2020). According to Hami & Abdi, (2021) students prefer a campus that has natural and landscape elements. Thus, although this study is examining an indoor environment, having a view of the outdoors and the size of the window is important to promote students' connection with nature and reduce their stress.

Psychological Aspects of Common Spaces

Universities have tried to create common spaces with the expectation that students will engage in social interaction and active learning; however, a gap emerged. Thus, it is essential to understand students' expectations of common spaces and maximize said expectations guaranteeing a diversity of ways to spend time in these spaces. A Japanese architect (Suzuki, 1993) proposed the concept of "*Ikata*" (modes of being in places) as a keyword for looking at the quality of the relationship between the self and the environment, and to consider the architecture for diversity. He believed that no matter how beautiful and splendid the architecture is, it is a problem if people cannot spend their time as they wish and there is no diversity in the place. As for common spaces, if they are created solely for the purpose of active learning, the space may exclude breaks for individual learning. Rather, it is important to understand multiple modes of being and consider how people can spend their time in their own way.

Previous studies that focused on university open spaces (including outdoors) revealed the contents of students' activities. Peker & Ataöv, (2020) clarified the variety of learning activities in open spaces (e.g., group discussions, individual studying, consulting with each other, relaxing, coincidental meetings, and chatting). They found that learning occurs from being in an open atmosphere, having fresh air outside, and from coincidental interactions with friends who are passing-by. Lau et al., (2014) conducted a case study by applying three categories of outdoor activities, which were identified by Shi et al., (2014): transitional activities such as passing-by, personal activities such as reading, and social activities such as meeting others. They found that students' activities related to the size of the open spaces and accessibility. Both studies questioned how students experience learning activities in open spaces and suggested the importance of diversity on campuses. As shown in Peker & Ataöv, (2020) and Lau et al., (2014), finding the patterns behind students' modes of being through qualitative research will elucidate the utility of common spaces and promote diversity.

METHODOLOGY

Mixed-Methods Approach

This study adapted a mixed-methods approach, which *"involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially"* (Creswell et al., 2003, p. 165). The physical aspects were examined quantitatively based on the accumulated knowledge, which was produced mainly in the field of classroom, and the psychological aspects were explored qualitatively to understand

students' perspectives. We explored the characteristics of common spaces that promote students' active learning from both physical and psychological perspectives.

We investigated the physical aspects using a Likert-type scale and a cluster analysis. Likert scales allow for more responses than do "yes/no" questions. We conducted a cluster analysis to paint a holistic picture of common spaces. It was suggested that the effects of physical factors vary across research, and that a combination of them is essential (Higgins et al., 2005). However, previous studies focused on individual factors and have failed to address the whole picture of the common spaces that students prefer. Cluster analysis is a statistical method for processing data, and it works by organizing items into groups based on how closely they are associated (Qualtrics, 2021). By using cluster analysis, we can explore multiple room types that promote students' active learning.

In addition, we asked students to share their perspective on what they would like to do and how they would like to spend their time in common spaces. To understand students' needs for common spaces, we analyzed and interpreted students' descriptions through text-mining.

Online Questionnaire

We conducted online questionnaires. While 155 participants completed the study, 11 respondents were excluded because they were workers, not students. Thus, the data from 144 participants (86 men and 58 women; mean age = 23.5 (SD = 5.8) years) were analyzed. Regarding education, 117 were undergraduate students, 24 were graduate students, and three "other." Regarding nationality, 133 were Japanese, 5 were Indonesian, 2 were Pakistani, 1 was Chinese, and 3 did not answer. Including participants of different sexes, educational levels, and nationalities bring richness to our data and interpretation. The questionnaires were distributed between October and November 2021.

The questionnaire consisted of three sections: students' evaluation of four physical aspects, free descriptions, and demographics. We divided each physical factor into seven levels (Figure 1) and asked which level they would feel most comfortable practicing active learning in. Respondents were also asked to answer free response questions about what kind of activities they would like to do and how they would like to spend their time in common spaces. Demographic questions queried about sex, age, nationality, and type of school.
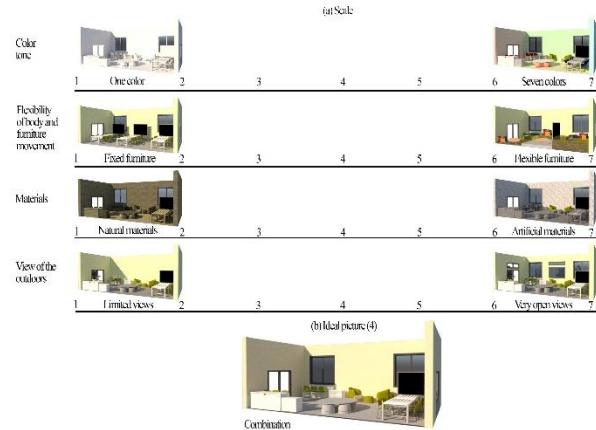

Fig. 1. Factors used in the research

We used three software programs in the modeling process: SketchUp by Trimble Inc USA, Vray by Chaos group Bulgaria, and Photoshop by Adobe Inc USA. The total area of common space in each module equaled 5 × 10 meters. According to Neufert's average human size, the assumption of one person's calculation requires a minimum of 1.75 m². The total area can be calculated as follow: 50 m² – (20% circulation) = 40 m²; 40 m² / 1.75 m² = maximum 22 users/people in one common space simultaneously. The simulation of the room given to the respondent is in the form of a rectangular shape with various possible visual orientations and various possible variations of activities that can be carried out inside. Color tone ranged from one to seven colors, flexibility of body and furniture movement ranged from fixed to flexible (e.g., floor seating), materials ranged from natural to artificial, and view of the outdoors ranged from limited to very open (all factors = 1–7 scales). We used an isometric picture to show the exact conditions of the common spaces.

RESULTS

Physical Aspects of Common Spaces that promote Students' Active Learning

To get the whole image of the environment, we conducted a cluster analysis, which divides participants into groups based on their answers. The scores of color tone, flexibility of body and furniture movement, materials, and view of the outdoors related to students' active learning were input as variables, and a hierarchical cluster analysis (ward method) was conducted with IBM SPSS Statistics version 27. Three groups were extracted. A one-way analysis of variance was performed to determine if there were any significant differences between groups (Table 1).

We found that 32 of the students perceived a room like Cluster A to promote active learning, 53

perceived B to promote active learning, and 59 perceived C to promote active learning. Significant differences were found in color tone, flexibility of body and furniture movement, and view of the outdoors. A and B had moderate flexibility, while C had more flexibility; for instance, the floor seating shown in C could be used in a variety of ways. In addition, the color tone of C was very colorful.

Table 1. Basic statistical information of each cluster on performative aspects

		M	*SD*	*F*	
Color tone	A	2.34	1.07	94.848***	A < B
	B	3.51	1.95		< C
	C	6.31	1.00		
Flexibility	A	3.44	2.11	42.704***	A, B
	B	3.09	1.94		< C
	C	5.97	1.33		
Materials	A	4.47	1.24	0.511	-
	B	4.15	1.67		
	C	4.37	1.53		
View of	A	6.19	0.90	63.32***	B < C
the	B	2.62	1.15		< A
outdoors	C	5.22	2.08		

***$p < .001$.
(Source: SPSS)

We used the mean score and drew pictures of each cluster (Figure 2). Cluster A was the most monochrome, with lower flexibility and more windows. In Cluster A, it was estimated that students imagined spending time in a calm space for individual study and could take a break by looking outside. Cluster B had the same low flexibility as A but was more colorful than A and had the least windows. In Cluster B, it was estimated that the students imagined completing individual learning and formal discussion inside the room, rather than looking outside to refresh. Cluster C was characterized by being much more colorful and flexible than A and B. In this room, students were expected to engage in a variety of activities, especially social interactions.

Students' Activities in Common Spaces

We conducted text-mining analysis on students' free descriptions about what they would like to do in common spaces. By using text-mining tool User Local, Inc., which provides an overview of the tendency of words to appear in a sentence, the words close to each other were gathered in the same group. Five groups were generated.

Group 1 consisted of six terms: university, read, study, task, space, and think. Group 2 consisted of seven terms: window, reading books, sitting down, consider, class, and feel. Group 3 consisted of four terms: table, friend, chatting, and spend. Group 4 consisted of six terms: report, friendly chat, drink, talk, conversation, and work. Group 5 consisted of seven terms: comfortable, conduct, able, friends, atmosphere, use, an relax. These five groups highlight the different functions and modes of being in a common space.

DISCUSSION

Physical Aspects of Common Spaces Which Make Students Active

Students' evaluations can provide clues to create person-centered architecture (Teston, 2020). In this study, we conducted an online survey about common spaces and examined students' evaluations of common spaces both physically and psychologically. Concerning physical aspects, this study conducted a cluster analysis rather than confirming significant effects on environments because it was posited that the physical factors were interrelated.

The cluster analysis revealed three clusters that highlight students' preference patterns. Physical aspects of color tone, flexibility of body and furniture movement, and view of the outdoors differed for each cluster. The monochromatic color in Cluster A was followed by a more rigid and fixed furniture arrangement. Regarding the number of colors and the level of flexibility, Cluster A was more suitable for activities

Fig. 2. Picture of each cluster for performative aspects

that require high concentration. Moreover, a combination of color tones emerged in Cluster B. As compared to Clusters A and B, in Cluster C, the body and furniture movement was the most flexible, followed by an increasing number of color tones. Cluster C will be more suitable for multiple activities such as lunch, playing music, and light physical exercise.

View of the outdoors has a different order from color tone and flexibility of body and furniture movement. Theoretically, we could expect a colorful and flexible room, such as Cluster C, to be connected to openness to the outside; however, the results were not aligned with our expectations. The monotone and non-flexible Cluster A was most open to the outside of all the rooms. We assume that the monochromatic colors and limited body movements shown in Cluster A promoted people to look outside because the room was too monotonous. Students may be looking for a certain balance in common spaces.

The meaning of "active learning" varied from student to student, especially concerning the three types of common space preferences. Students who would like to meet friends and socialize will prefer Cluster C, while the students who want to study individually will prefer Clusters A or B. The physical characteristics of the common space may change the direction of students' activities. To ensure a diversity of learning styles throughout the campus, it might be valuable to create all three types of common spaces: room A will direct students' attention outside, room B will encourage concentration, and room C will promote social interaction.

Multiple Functions of Common Spaces and Its Educational Value

We identified five groups of students' free descriptions. As noted in the Introduction, we will interpret students' descriptions from the viewpoint of what kind of "modes of being in places" could be

created in the common space. "Modes of being in places" indicates the quality of the relationship between the self and the environment, and it suggests how we spend our time in the place.

First, the words gathered in Group 1 suggest "concentration." Students will "read," "study," and "think" about their "task" at a "space" located in the "university." In this situation, students concentrate on their task care less about the environment. This concentration mode is supported by using the spaces alone, and their body is oriented in one direction. The words gathered in Group 2 also suggest private use of the space; however, words like "window," "feel," and "consider" suggest a broader view orientation. In Group 2, students are not just conducting the tasks at hand, they are "reading books," "sitting down," watching the "window," and "feeling" something. In this situation, students can do "playful reflection."

Compared to Groups 1 and 2, Groups 3 and 4 implied social interactions. The words gathered in Group 3 suggest "communication." Students "spend" their time with a "friend" and are "chatting" at a "table." In this situation, students use the common spaces in a semi-private way, which means it is open to others; however, they are mainly talking to a specific person, and their body and view orientation at this time is broader. Group 4 also suggests social aspects; however, Group 4 has more variation of activities: we call this mode "multiple activities." Students can conduct their "report," have a "friendly chat," "drink," "talk," have a "conversation," and "work" there. The words in Group 4 denote various activities and all seem to fall into a semi-public domain, in which less manners and rules are required as compared to a private space.

The words in Group 5 are a bit different from the previous groups, and we named it the "going with the flow" mode. In Group 5, there are no concrete actions included, but students suggest their feeling and impressions in common spaces. For example, they used "comfortable," "relax," and "atmosphere."

Table 2. Students' modes of being in places estimated from the description of their activities

| Group	Terms	Modes of being in places	Characteristics
1	University, read, study, task, space, think	Concentration	Private, single, one direction
2	Window, reading books, sitting down, consider, class, feel	Playful reflection	Private, single, broader view orientation
3	Table, friend, chatting, spend	Communication	Semi-private, broader view orientation
4	Report, friendly chat, drink, talk, conversation, work	Multiple activities	Semi-public, variations of activity and interaction
5	Comfortable, conduct, able, friends, atmosphere, use, relax	Going with the flow	Most open, dependence on the situation

(Source: survey data)
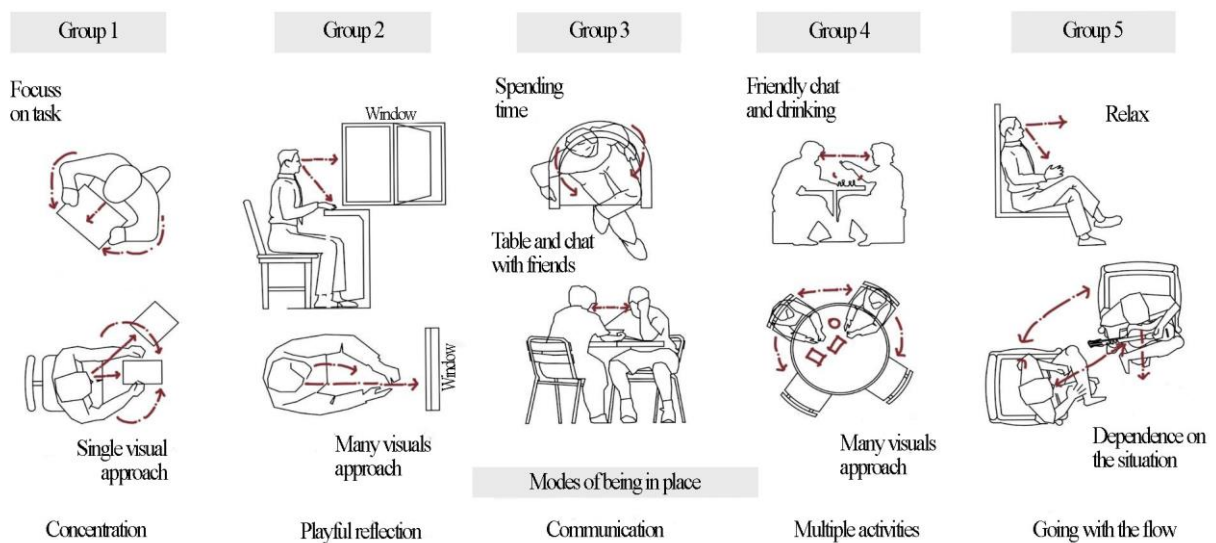
Fig. 3. Modes of being in the five groups

Concurrently, they used vague words such as "able," "use," and "conduct." It was estimated that students use common spaces in an open way, and they just go with the flow depending on the situation.

Based on students' descriptions in Table 2, we explored the conditions of "modes of being in places" and found that diverse visual orientation and interaction are key for common spaces. In Figure 3, we can see how each "mode of being in places" creates diversity in visual orientation and interaction.

CONCLUSION

This study identified the characteristics of physical environments that promote university students' active learning and the psychological aspects (i.e., "modes of being in places") associated with common spaces in a university setting. We conducted an online questionnaire and analyzed the data using cluster analysis and text-mining. We found three patterns of common spaces and five groups of students' modes of being in places. Three common spaces emerged: rooms like Cluster A encourage "playful reflection," rooms like Cluster B encourage "concentration," and rooms like Cluster C encourage "communication." However, these one-to-one relationships do not allow each student to spend their time as they wish, and they are not diverse. In addition to the above three, "multiple activities" and "going with flow" should also be included to further examine the characteristics of common spaces that guarantee diverse ways of being. In particular, information on how other students spend their time in the space might be an important factor in guaranteeing said diversity (Suzuki, 1993); thus, these should be examined in future research. The physical

and psychological aspects found in this study are the first step toward a common space for diversity. Further study is needed on how to proceed with actual construction.

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