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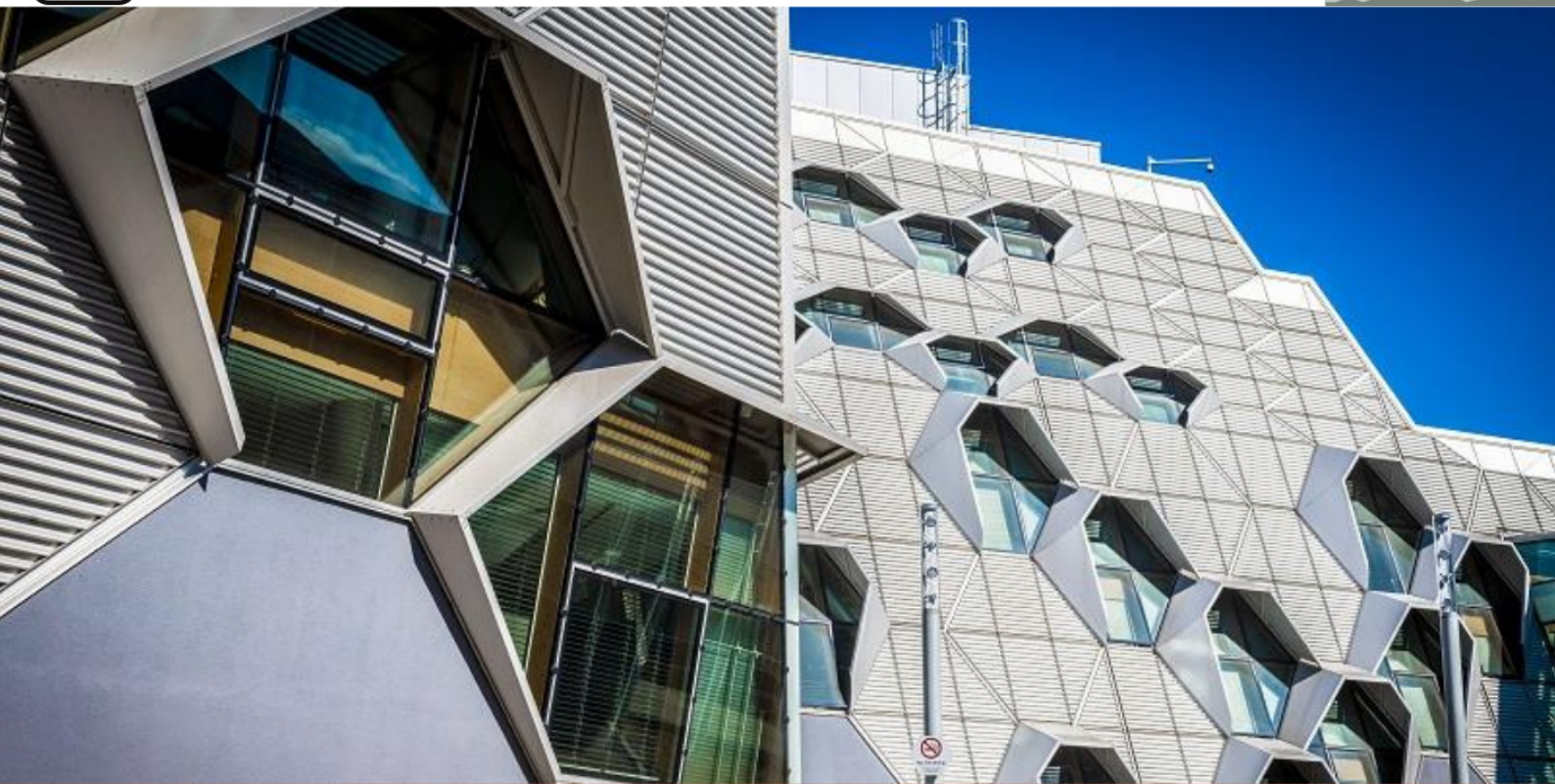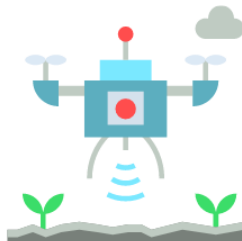**Coventry University**

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Effects of Pedagogical Transition on Classroom Design

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Abstract

Active learning has played an important role in recent years as it carries a highly positive effect of improving students' learning attitude and successiveness. Indeed, classroom design is a determinative factor in the performance of learning and teaching. Continuous assessment of learning performance is crucial that could indicate the direction of future classroom renovation to provide an advanced learning and teaching environment for students and teachers. Hence, this paper aims to provide a better understanding of the latest trend in learning mode preference. The characteristics and reasons for choosing active and traditional learning were examined from the students' perspectives using questionnaire surveys. Moreover, this paper focus on the effects of pedagogical transition on design factors and design criteria for a flexible classroom. The analysis of the responses collected from the students' perspectives shows interesting findings useful for adopting the active learning approach and for classroom design. Most of the factors were rated very important by the students, which shows the various factors should be considered by teachers and administrators in the delivery of teaching instructions and the classroom design, respectively. A different mix of traditional and active learning approaches might be suitable, depending on the subject's intended learning outcomes. A traditional approach will facilitate learning more orderly, although most of the instructions are from the teacher, while active learning is more collaborative and engaging for the students. Practical implications of the study were also discussed.

Keywords: Traditional learning, active learning, design factor, design criteria, built pedagogy

1.   Introduction

The learning environment influences learners' study attitudes, and the design of the classroom reveals the educational philosophy and ideology (Park & Choi, 2014). There is a significant change in pedagogical methods in recent years as modern technology is now evolving. There are several drivers of the pedagogical change, including the progressive accessibility of interactive learning platforms, high availability of quality information on the web, and easy mobile device connectivity with the Internet (Ehlers & Schneckenberg, 2010). The ability to utilize interpersonal skills and effective communication skills is crucial in the workplace, which is cultivated and developed from education. Consequently, the pedagogy has shifted from a traditional teacher-centered teaching mode to a more active mode with students' participation and interaction in group discussion, especially in tertiary education.

With a steady and fixed lecture-style configuration, the traditional learning space limits the way students learn and how students think about what they are learning (Rand & Gansemer-Topf, 2017). Usually, traditional classrooms are spacious with a screen or blackboard in the front, allowing teachers to share information easily with the forward-facing design. Students focus on the screen most of the time to receive knowledge from the teacher and take notes. Not many interactions between the teachers and students or discussions between the students themselves are involved throughout the lecture. The monotonous design of the classroom makes the student feel bored and create distances between students and teacher. The fixed furniture design is physically inconvenient for group discussion or other interactive sections, limiting the chance for exchanges of views, opinions, ideas, and thoughts. There is a higher chance that laziness of thinking occurs because of the single delivery of knowledge and information in the traditional teaching mode. The presence of low motivation will affect the learning efficiency of students.

From the traditional teacher-centered passive learning mode to a student-centered active learning approach, a fundamental pedagogy change has emphasized the importance of establishing an interactive learning environment for students and teachers and developing collaborative group spirit among students. There is a need to design the learning spaces by minimizing physical barriers for students and teachers and facilitating the active learning approach.

The current study aims to examine how the classroom designs impact the different learning approaches from the student perspectives. The key criteria for designing active learning spaces for university students will be identified in this study towards providing better learning and teaching space in the future. The study would also examine the impact of different learning spaces on teacher pedagogy, student learning outcomes, and student engagement to figure out which classroom designs can provide a suitable and comfortable learning environment, as it is believed that the student learning behaviors and experiences will be shaped and the pedagogical practices will be characterized by the physical classroom design (Byers et al., 2014). This type of research plays a vital role in conducting a continuous assessment of the students' learning performance and providing initiatives to improve and justify classroom space designs in the future (Rand and Gansemer-Topf, 2017).

2.   Active learning and traditional teaching: A Review

Active learning is defined as a learning approach emphasizing critical thinking that involves students doing things and thinking about what they are doing (Fink, 2013). Active learning emphasizes the application of modern technology, enabling the presentation of some complicated concepts by adopting dynamic and spatial image technology. Many technologies help teachers deliver knowledge in diverse ways and facilitate engagements (Chiu & Cheng, 2017). Modern technology such as mobile phone, computer, and virtual reality can help a teacher explain a complicated idea with more visualized methods that facilitate active learning; the teacher can explore different tools and videos from modern technology and combine with the main idea of the class.

Teachers can provide more learning activities with useful devices. It provides opportunities for teachers to share information creatively by adopting the modern technology and improving the quality of learning. A perfect design of multiple wireless devices and battery-power management is a necessary design criterion in an active learning classroom (Harrison and Hutton, 2013). The rapid change in communication technologies also brings effects on the teaching and learning mode. For instance, a mobile phone has become a small-scale computer in which people could easily access different communication platforms or software, facilitating interactive activities in classes (Friedman & Friedman, 2013).

Kahoot! is one of the popular and common online learning platforms convenient for classes to enhance student engagement, vitality, interaction, and metacognition in tertiary education classrooms and works even if students and instructors do not have skillful training (Plump & LaRosa, 2017). This type of online platform is developed based on prevailing user-centered and behavioral design methodology. It is shown that students were satisfying and welcome the use of Kahoot! to give responses. As it supports real-time response and feedback, instructors and professors have an opportunity to tailor their subject in various disciplines based on students' understanding and knowledge on small quizzes (Johns, 2015). Furthermore, these platforms allow anonymous participation that creates higher student engagement. The classrooms equipped with modern technologies make it easy to access the platforms to carry out interactive activities. Besides mobile technology, flexible furniture is a crucial factor to success that encourages active learning pedagogies.

In order to achieve the need for active learning, the learning space design is the fundamental factor involving both technological support and classroom facility matters (Skill & Young, 2002). Simultaneously, teachers must cooperate in using the tools provided to implement active learning smoothly and support students' knowledge construction. A project in North Carolina State University that has implemented studio-based, collaborative learning to the large-sized classes has figured out that the classroom design had a highly positive effect of improving students' problem-solving ability, promoting conceptual understanding, and better learning attitudes (Beichner, 2014). The classroom design with a suitable desk and chair arrangement can enhance students' active involvement and provide students with more in-class feedback. For instance, round tables could facilitate interactions between mentors and students as students work on exciting tasks collaboratively (Chiu & Cheng, 2017).

Moreover, a comfortable learning environment is essential for students' learning progress, such as good air quality and sufficient lighting with natural daylight. When students feel

comfortable in the classroom, they are more willing to spend time in the classroom and simultaneously increase the learning progress and incentive of learning (Rook et al., 2015). Intensive training is an essential consideration to implement active learning. There is an increasing trend in developing active learning classrooms worldwide (Beichner, 2014). Recently, there is a dramatic transformation in the pedagogy. Teaching mode has shifted from teacher-centered practices with primarily one-way delivery of information to student-centered and flexible learning approaches (Jamieson et al., 2001). The teaching mode does not rely solely on PowerPoints and presentations from the teachers and with response and discussion from students.

One of the essential factors contributing to this change worth mentioning is technology (Lippincott, 2006). In a fast-paced society, modern technology is developing very quickly, which significantly changes teaching and learning. Teachers have many other resources and a new method to explore the way to share knowledge. For instance, the teachers can create a game-based learning platform such as Kahoot to engage students in the class and evaluate their understanding of the topics immediately. Other teaching technologies that contribute to the active classroom include social media, online courses, online learning platforms, and virtual reality. Educational technologies have created a new trend for teaching and learning, which significantly inspires the education organization, such as university or college, to adapt the pedagogical change (Chiu, 2016).

In order to collaborate with the pedagogical change, the adjustment on the classroom design has become an indispensable step in achieving success for active learning. Using more new technology for teaching, the traditional classrooms designed to simply present information to students are not appropriate for new teaching methods (North, 2013). Under the current development, teachers will use different equipment to share teaching materials, videos, and other new tools to deliver knowledge to students. Therefore, new classrooms typically require more space for equipment, and easy access to this equipment is provided for the students and teachers. Students are also encouraged to have more active and teaching-related discussions, interactions, and responses to the teachers and other classmates under the active classroom approach. The teacher may again walk around to support and help students using the new technology to learn and do the assessment. To cater to the high demand interactions between students and teachers, flexible and accessible classroom design is paramount (Ellis and Goodyear, 2016). Layout design such as having wider aisles and furniture design such as having movable chairs and tables are believed to be an effective design for the new pedagogical change.

2.1   Comparison between Traditional and Active Learning

Traditional teaching (TL) refers to the teacher-centered teaching mode that concerns primarily one-way delivery of information. For the design of a traditional classroom, a teacher stand is usually placed in the front, and long tables for students are facing the front stand, which forms an authoritative position that teachers could monitor and control their students' seats remain stationary, and in arranged rows (Eradze et al., 2019). It is more suitable for memorizing facts and theory-based coursework as students act as the passive role of receiving knowledge and information. The traditional learning approach may have limited the chance to practice in real reality. Student can simply receive knowledge from what the

teachers prepared and the book content, therefore, the classes which are applying traditional teaching approach have fewer practical skills. Moreover, one-way delivery of knowledge causes less discussion between teachers and learners and between students. Having a discussion section in a lesson has considerable advantages. Interpersonal skills are essential in the workplace, which are also called soft skills, including listening, communication, cross-cultural connection, team problem-solving skills, etc. (Nealy, 2005). It would be a shortage of adopting traditional learning. Traditional teaching mode limits the discussion chance of students.

The active learning (AL) approach is defined as "pedagogies of engagement," which encourage a higher level of transferring, understanding, and applying knowledge (McCormick et al., 2013). The active learning approach aims to engage students proactively with the cooperation of group discussion, role play, case-study teaching, problem-based learning, and other practices (Drew & Mackie, 2011). However, the major challenge for tertiary education is not to offer students comprehensive information and thorough in-depth knowledge, but to help students build it up by their own experiences. The active learning methodology is an excellent way to achieve this requirement. Active learning strategies are a simulation approach that contains four distinctive characteristics: (i) an exploration for understanding and meaning, (ii) attention at student responsibility, (iii) an apprehension of knowledge as wells as skills, and (iv) a strategy to the curriculum which goes beyond graduation to a far-reaching social and career setting (Stalp & Hill, 2019). A higher degree of learners' responsibility can be achieved through active learning, while teacher guidance is still important in the active learning approach. Active learning space includes interaction between students and teachers with the use of classroom design and different technologies.

Active involvement of students in class is believed to have significant effects on students' achievements. Students are deeply engaged in active learning activities instead of surface learning, facilitating students to transfer and apply knowledge effectively. Those activities advocate thinking skills at higher altitudes (Baepler et al., 2014). Through interactive team activities, the students' experience can be enriched by stimulating students spiritually to share thoughts in personal perspectives (Dewing, 2008). The active learning approach promotes critical thinking by triggering psychological and cognitive processes (Popil, 2011). Critical thinking can be treated as purposeful thinking that an individual imposes intellectual criteria and standards upon his/her thought habitually and systematically (Ahmad et al., 2012).

The critical thinking process, which also helps develop decision-making skills, has been increasingly necessary for society. The competitiveness of students could be increased by adopting an active learning strategy. However, when implementing active learning, several challenges would be faced. For instance, whether the commitment of educational institution on learning systems deployment is clear, the assessment methods should be reformed or amended, the availability of faculty staffs, resources and support services when implementing active learning approach, and the concern on patience and usual practice of students and professors who are accustomed to passive traditional learning mode (de Novais, Silva & Muniz, 2017). A summary of these learning approaches is highlighted in Table 1.

Table 1: Comparison between Traditional and Active Learning

Traditional Learning	Active Learning
Teacher-centered	Student-centered
Students mainly as listeners	Students involve more than listening, also share values and thoughts
Focus on memorization	Higher order thinking process
One-way delivery of knowledge	More interaction between instructors and learners
Fewer technologies involved (projector only)	A high degree of technology utilization

3. Research Methodology

Given the recent pedagogical development, a study titled "Design criteria of flexible classroom design for traditional and active learning" was undertaken at the College of Professional and Continuing Education (CPCE), Hong Kong Polytechnic University. The study was carried out after the learning spaces' refurbishment work involving upgrading, updating, and creating modern and innovative classrooms and associated facilities. The renovation work is meant to improve the prevailing learning and teaching environments for both learners and teachers to meet the changing and rising learning needs. The objectives of the research are: (i) to examine the effectiveness of the learning environment on the learning efficiency of students; (ii) to classify common learning and teaching pedagogies have been adopted worldwide; and (iii) to present essential elements for creating a stimulating and active learning environment for students. It is believed that the student learning behaviors and experiences will be shaped, and the pedagogical practices will be characterized by the physical classroom design (Byers et al., 2014). The study plays an important role in conducting a continuous assessment of the students' learning performance and providing initiatives to improve and justify classroom space designs in the future.

A quantitative research method involving questionnaire surveys was adopted for the study, and the data collected was analyzed using Statistical Package for the Social Sciences (SPSS version 23). The questionnaire surveys were distributed to students in the School of Professional Education and Executive Development (SPEED). Questionnaire items were formulated based on the findings from the desktop study and literature review. Empirical data from the students were collected on their perspectives of the traditional and active learning approaches. The respondents' preference between traditional learning and active learning, key design criteria for active learning spaces were analyzed according to a 5-point Likert rating scale (i.e., 1 = strongly agree; 2 = agree; 3 = no comment; 4 = disagree; and 5 = strongly disagree).

3.1 Respondents' demographics

Survey respondents were full-time and part-time students majoring in Surveying and Building Engineering and Management from SPEED. The students' perceptions of the reasons, limitations, and benefits of using traditional and active learning were investigated and the type of facilities required in a classroom, and the important criteria to consider in classroom

design to facilitate learning. The questionnaire survey forms an important part of the research to evaluate students' perspectives on the learning space they experience. A total of 156 students responded to the survey comprising of 84 full-time students and 72 part-time students.

4.   Data analysis, results, and discussion

Statistical tools such as Cronbach's alpha reliability test, mean score ranking, and standard deviation were used to analyze the data collected via the questionnaire surveys. The deductions based on these analyses are discussed in this section.

4.1   Reliability test

Cronbach alpha (α) reliability test was used to assess the questionnaire items and their associated constructs to ensure consistency (Field, 2009; Olawumi & Chan, 2019). An acceptable threshold for the α-test is 0.7 and above, while α has a value range of 0 to 1 (Olawumi & Chan, 2020). The results' analysis shows an α-value of 0.898, which is higher than 0.70 and confirms the acceptability of the data for further analysis.

4.2   Ranking and significance of the factors

The 33 items of the questionnaire survey were ranked based on their mean score (MS) and standard deviation (SD) values. The factors are sub-grouped within the eight groups A – H and ranked within their distinct groups (see Table 2). More so, where two or more factors have the same MS, their SD values will be used as a defining factor in their' without ties' ranking (Olatunji et al., 2017). Factors with lower SD values are ranked higher.

Using the scale interval interpretation developed by Li et al. (2013), the MS values of the factors were given linguistics classification as follows. "Extremely important" (MS ≥ 4.51); "Very important" (3.51 ≤ MS ≤ 4.5); "Important" (2.51 ≤ MS ≤ 3.5); "Somewhat important" (1.51 ≤ MS ≤ 2.5), and "Not important" (MS < 1.5). The analysis of the factors' significance as revealed in Table 2 shows that most factors fall within the "very important" significance range, and a few factors can be classified as "important" within their sub-groups.

Reasons for AL and TL: The same set of questions were asked the students for both the traditional and active learning approaches. The students strongly opined that traditional learning provides direct receipt of information from teacher (MS= 4.46, SD= 0.605) and allows for teaching to be conducted in a more orderly manner (MS= 4.13, SD= 0.793) compared to the active learning approach (C1: MS= 3.77, SD= 0.963 and C4: MS=3.50, SD= 1.081). TL also allows for more time-saving due to one-way transfer of knowledge and less discussion required than the AL. Students agreed that there is no difference in understanding the subject matter and time allowance for the Q&A section between active and traditional learning.

Limitation of AL and TL: For the traditional approach, the students noted that they find it difficult to concentrate for a long lecture period (MS= 3.78, SD= 1.049) delivered by the teacher compared to the AL approach, which facilitates student engagement and interactions. Students concurred that there is no collaborative learning atmosphere in the TL approach

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with other students (MS= 3.64, SD= 0.990) and less chance to allow students to express their ideas (MS= 3.41, SD= 1.065). For the active learning approach, students agreed that it is challenging to control class order (MS= 3.54, SD= 1.074) coupled with the fact that it is time-consuming, and students might not be the focus on discussion. However, some students' tendency to work alone was not considered a key hindrance to the AL approach.

Benefits of the AL approach: When it comes to the benefits of active learning, students agreed that the benefits brought by active learning far exceed its limitations, and the significance of the active learning benefits is a very satisfactory level. Students strongly agreed that the AL approach significantly improves their collaborative skills (MS= 4.19, SD= 0.760) while promoting interactions (MS= 4.17, SD= 0.826) and engagement with their peers and teachers. More so, such interactions during the AL teaching classes enable the students to learn from each other (MS= 4.07, SD= 0.836) and motivate them to learn and think independently. All these benefits are all rated very significantly by the students.

Classroom design: The students believed that their access to the internet would facilitate learning (MS= 4.33, SD= 0.692) and the provision of essential AV/IT equipment in the classroom (MS= 4.24, SD= 0.646). Meanwhile, large monitors for presentation and modular tables and movable chairs are considered necessary facilities for AL's effective classroom design. Moreover, adjustable lighting and temperature (MS= 4.25, SD= 0.724) in the classroom and comfortable chairs (MS= 4.24, SD= 0.798) were highly rated by the students as key criteria for effective classroom design.

Table 2: Mean ranking and significance values of the factors

Code	Descriptions / Questions	Overall (n=156)			
		Mean	**SD**	**Rank**	**Significance**
A	**Reasons for traditional learning?**				
A1	Direct information from teacher	4.46	.605	1	Very important
A2	Time-saving (group discussion may waste time)	3.78	.981	5	Very important
A3	Allow more time for Q&A	3.81	.956	4	Very important
A4	Teaching conducted in an orderly manner	4.13	.793	2	Very important
A5	Understanding of the subject matter	4.01	.770	3	Very important
B	**Limitations of traditional learning?**				
B1	No collaborative learning atmosphere with other students	3.64	.990	2	Very important
B2	Difficult to concentrate for a long duration	3.78	1.049	1	Very important
B3	Less chance to allow students expressing their ideas	3.41	1.065	3	Important
C	**Reasons for active learning?**				
C1	Direct information from teacher	3.77	.963	3	Very important
C2	Time-saving (group discussion may waste time)	3.40	1.064	5	Important
C3	Allow more time for Q&A	3.85	.976	2	Very important
C4	Teaching conducted in an orderly manner	3.50	1.081	4	Important
C5	Understanding of the subject matter	3.99	.819	1	Very important
D	**Do you think classroom design is crucial to facilitate learning?**	4.05	.698	-	Very important
E	**Benefits of active learning?**				
5.1	Students learn collaborative skills	4.19	.760	1	Very important
5.2	Enable student engagement	4.13	.707	3	Very important

Code	Descriptions / Questions	Overall (n=156)			
		Mean	SD	Rank	Significance
5.3	Promote student interaction	4.17	.826	2	Very important
5.4	Students learn to think independently	4.00	.803	6	Very important
5.5	Students can learn from others	4.07	.836	4	Very important
5.6	Promote learning motivation	4.03	.795	5	Very important
F	**Limitations of active learning?**				
6.1	Difficult to control class order	3.54	1.074	1	Very important
6.2	Discussion is not focused	3.42	1.119	3	Important
6.3	Time-consuming	3.51	1.038	2	Very important
6.4	Students prefer to work alone	3.38	1.068	4	Important
G	**Types of facilities required in the classroom?**				
7.1	IT/AV provisions	4.24	.646	2	Very important
7.2	Large monitors for presentation	4.07	.866	3	Very important
7.3	Internet access	4.33	.692	1	Very important
7.4	Swirl chairs (for lecture theatre only)	3.76	.951	5	Very important
7.5	Modular table and movable chairs (for tutorial room only)	4.03	.811	4	Very important
H	**Criteria of classroom design to facilitate learning?**				
8.1	Adjustable lighting	4.12	.709	3	Very important
8.2	Adjustable temperature	4.25	.724	1	Very important
8.3	Comfortable chair	4.24	.798	2	Very important
8.4	Vibrant colors	3.78	.882	4	Very important

Overall, the students opined that the classroom design (D) is crucial and has a lot of bearing in facilitating effective learning.

4.3   Practical and research implications

The introduction of modern technology is necessary for developing a flexible learning environment. The flexible classroom design emphasizes the high degrees of multi-functionality and user-friendliness that the classroom could fulfill different types of teaching modes, such as lectures and classes requiring different extents of discussions. Hence, as revealed from this study's findings, classrooms should be designed to facilitate students collaborating in varying group sizes and equipped with modern technologies in supporting computer activities. It should also allow flexibility and support multiple uses of the learning spaces. Also, teachers should be able to move close to students and walk freely around the classroom to engage individual students without physical obstacles.

Built pedagogy indicates the ability of space that characterizes the teaching and learning strategy. A well-designed classroom, which is a crucial factor in facilitating and encouraging active/cooperative learning, would provide a suitable learning environment for learners for educational and social purposes. It can maximize facility utilization (Alden Rivers et al., 2015) as well. When considering the design of an active learning environment, it is critical to assess its (i) functionality – adaptability and flexibility; (ii) comfortability; (iii) user-friendliness and (iv) aesthete should be considered.

5.   Conclusion

The rapid development of information and communications technology has brought a considerable change in the pedagogical approach to learning and teaching in tertiary education. The pedagogy has shifted from a traditional teacher-centered teaching mode to a more active mode that encourages students' participation and interaction in group discussion. In order to achieve the need for active learning, the learning space design is the fundamental factor. This study examined various factors regarding traditional and active learning approaches and the design of classrooms for effective learning.

The analysis of the responses collected from the students' perspectives shows interesting findings useful for adopting the active learning approach and for classroom design. Most of the factors were rated *very important* by the respondents. A few were rated important, which shows teachers and administrators should consider the various factors in the sub-groups in the delivery of teaching instructions and lessons and the design of the classroom, respectively. Also, a different mix of traditional and active learning approaches might be suitable, depending on the subject's intended learning outcomes. A traditional approach will facilitate learning in a more orderly manner. However, most of the instructions are from the teacher, while active learning is more collaborative and engaging for the students.

It is found that students were satisfied with the completed renovation and upgrading work and conformed that the modernized and refurbished teaching spaces in CPCE will facilitate collaborations between students as well as interactions between students and teachers. The newly equipped classrooms supported by a variety of modern technologies can ease presentations and classroom discussions.

The study's findings would be significant for teachers who intend to design the teaching and learning method for their class as well as for teachers and administrators in designing and integrating the key design criteria for classrooms. Future studies will consider these factors from the perspectives of teachers and administrators.

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