A proposed methodology to study the learning space in higher education context

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Abstract
Designers have long designed and built an environment with certain characteristics such as shape, form, size, scale, function and appearance. However in accommodating certain activities that involve human ‘creativity’, studies have identified other characteristics other than the ‘regular’ ones whilst these other characteristics are often difficult to articulate and quantify. Teaching and learning process can be considered as a good example of such activities. Further reviews on the teaching and learning process have demonstrated the significant influence of the environment, including space, on the process. A research project has been set to conduct a study on the relationship between the learning environment and the learning process, how a learning space affects learning, and the possible needs, importance and opportunities to develop a space for teaching and learning that is interactive and responsive to support the learning process. This paper aims to present a review as well as a proposed methodology to conduct the investigation. Conclusions were drawn and further steps of the investigation were identified.

1. Introduction

For many years, designers have designed and built an environment which is static and believed to have control and affect on the human emotions and senses by its characteristics such as shape, form, size, scale, function and appearance. However in accommodating certain activities that involve human ‘creativity’, studies have identified other characteristics that can be equally important to (if not more important than) the ‘regular’ characteristics whilst these other characteristics are often difficult to articulate and quantify (e.g. Sterry and Sutrisna, 2008). Teaching and learning process can be considered as activities that involve human ‘creativity’ (Smith, 1999). Further reviews on the teaching and learning process have demonstrated the significant influence of the environment, including space, on the process (Emmons and Wilkinson, 2001; Huitt, 2003).

In response to that, a research project has been set to conduct a study on the relationship between the learning environment and the learning process, how a learning space affects learning and the possible needs importance and opportunities to develop a creative space for learning, which is vibrant, dynamic, intelligent, interactive and responsive to the human emotions and senses. The scope of the investigation is set within the higher education formal lecturing environment. When taking a formal lecture classroom into consideration, other activities are included such as the use of audio visual equipments, i.e. slide show or OHP projectors and movie projectors, thus putting the lecturing space in the context of the learning process. One among the various objectives of this investigation is to investigate how can a built space adopt it’s user interface according to the functions carried out within it, the various ways in which it can or cannot respond to the user, in order to attain this user interface should it be a remote controlled space or can it be more sensible than that, can this approach be a key factor for inclusive design, user centred design and design for all notions.
The research also intends to investigate the relationship of this topic with the issues relating to sustainability and ‘Architectural Forecast’ in the Learning environment.

2. Learning Process

Learning more often becomes a lifeless, sterile, futile and quickly forgotten stuff that is pushed in to the mind of an individual tied to a seat (Smith, 1999). Most of the psychological books of 1960s and 1970s define learning as a change in behaviour. However not all behaviour changes results from learning. If learning can change the behaviour, the opposite effect, i.e. behaviour can affect learning, must be valid either. Each individual perceives learning in different terms. In the report by Smith (1999), the perception of various adult students on learning were considered within five categories, namely learning as a quantitative increase in knowledge, learning as memorising, learning as acquiring skills, learning as making sense, and learning as understanding reality in different ways.

Whilst the first three categories can be considered generic and commonly understood, the last two categories involve ‘other’ elements that are indirectly or directly related to learning. For instance

“The environment shapes one’s behaviour; what one learns is determined by the elements in the environment, not by the individual learner” (Smith, 1999).

And he also claims that learning is more effective when the learner is active. So, activity is very important in the learning process. Learning has also been considered effective only when various needs of the individual are satisfied in first case. Such needs are physiological needs (hunger, thirst, sex, sleep, relaxation), safety needs (sense of feeling safe and secure), love and belongingness (warm and friendly relationships), self-esteem needs (desire for strength, achievement, adequacy, mastery, competence, confidence, independence, reputation and prestige), and self actualization which involves the qualities of the learner such as self initiative, personal involvement, personal behaviour, learner evaluation on learning and the meaning what the learner makes out of it. Teaching is another important influential factor in learning as well organised teaching can enhance better learning. Different styles of the lecturer and different methods of lecturing are influential to learning.

Further on various factors influencing learning process, Huitt (2003) has developed a model for analysing the learning process that is called the “Transactional Model of the Teaching/Learning Process” (refer to Figure 1) which classify the factors into four categories namely,

- Context – Includes those external factors outside the classroom that will influence the teaching and learning
- Input – Includes those qualities what teacher and students bring with them to the classroom.
- Classroom Process – Includes teacher and student behaviour within the classroom, the classroom environment, and the student and teacher relationship.
- Output – Includes the measures of the student learning.
Fig. 1. The transitional model for teaching/learning process, (adopted from Huitt, 2003)

3. Spatial Influence on Learning:

“If every classroom had a little peep hole that anyone could look through, at any point in time throughout the century they would find many interesting and perhaps alarming things” (Sturz et al., 2005).

From literature study, researchers have discussed various issues that have both negative and positive effects on learning including the effects from the learning environment. Different studies follow different ways of learning as intelligence covers nine different areas namely verbal-linguistic, mathematical-logical, musical, visual-spatial, bodily kinesthetic, interpersonal, intrapersonal, naturalist and existential. The different learning may also be due to the cultural differences (Sturz et al., 2005). Hence there has been discussion on designing the learning environment to be more conducive to cultural differences. Sztejnberg and Finch (2006) reported that a comfortable and attractive classroom can stimulate learning. It also found that the seating arrangements and the distance between the student and the teacher affect the learning in the classroom. The report also shows that students who are seated in the first two rows potentially perform better than the students seated elsewhere whilst the horseshoe arrangement considered more useful for a classroom discussion. In general, researchers studying classroom environment consider four major factors of the classroom environment, namely the physical environment, time/instructional management, behavior management and teacher effectiveness whilst the main categories of students learning style considered environmental, emotional, sociological and physiological as the defining factors (Sztejnberg and Finch, 2006).

Emmons and Wilkinson (2001) asserted that environment has a direct impact on learning as students will learn better in a well designed classroom and can be distracted by poorly designed space. It was also found that different people react to the learning environment differently. Illeris (2004) discusses that the learning is a process by which an individual acquires knowledge and skills. Thus professionally, learning can also be considered within the field of psychology, together with factors like senses, reasoning and memory.

Various design parameters that govern the designing of the learning space can also be studied to provide some insights. The University of Maryland in the USA, for instance, has formulated the list of design standards and requirements for its institutional buildings.
According to that design standards, the teaching and learning space has to be planned and organized with lot of care, it involves lot of professionals such as architect, mechanical engineer, electrical engineer, lighting designer and audio visual specialist. According to the standard, there are certain factors that have to be considered as follows:

- **Location** – the access for the classroom has to be easy for both students and the equipments, the adjacent space of a classroom should be chosen on such a way that they are not noisy like mailrooms, reception area, dining facilities, rest rooms, or other socializing space. So that the class room has to be silent and isolated from the noisy areas.
- **Entrance** – Entrance should be in such a way that it should avoid student traffic passing through the places that are non instructional areas, the entrance should also be placed in such a way to avoid the unwanted noise generated by the corridors and hallways.
- **Seating** – The seating should accommodate the programmed strength of the classroom and also have an additional support space, accommodation for audio visual equipments should also be considered. 10% of the seating furniture have to be designed for the left handers.
- **Floor, walls and ceilings** – The size of the projection screen and the sight line of the students have to be taken in to consideration for designing the floors, walls and ceiling.
- **Projection screen** – Dual projection screens have to be incorporated so that lecturers can simultaneously project slides and write on the other board.
- **Accessibility** – The access to be barrier free, and stations for the wheelchair has to be well demarcated.
- **Noise control** – placement of vending machines, restrooms and drinking fountain facilities has to be well designed to avoid the noise pollution around the classroom.
- **Data** – infrastructure facilities have to be provided in all rooms to accommodate wireless and wired connectivity.
- **Telecommunication** – all class rooms have to be connected with campus phone facilities.
- **Natural Lighting** – it is one of the main features that is desired in all classroom.
- **Electrical** – HVAC and electrical lightings for all classrooms also have to be designed by considering all standards and safety measures.
- **Sundry issues** – trash cans are to be provided in all classrooms.

Another institution, the Pennsylvania State University in the USA, has designed the minimum requirements of their classroom they are as follows;

- **Classroom Design** – The design should be according to the needs of the classroom not by the needs of the building design. The factors that has to be considered are better sight lines, better seating arrangements, better adaptation of technological needs, adequate instructional area, adequate distance from the board wall to the first row of students seats, all electronic and electrical controls have to near the lecturer podium and be totally accessible, and the classroom should be away from the noise generating areas.
- **Room Dimensional ratios** – The factors have to be considered when it comes to the classroom dimension includes rooms width to length between 1-1/2 to 2 and 3 to 4 with the instructional end on the narrow dimension (for rectangular room), room shape greatly impacts space efficiencies for a particular classroom need so acute angle
in the design has to be avoided, and for auditorium rooms more fan shaped with seating, screen and instructional needs dictating the shape.

- Visual – The specifications have to be followed in achieving better visual quality of a classroom includes all student seats to be within 90 degree side to side cone established with 45 degree to screen centreline, seats to be no closer tan the dimension of the screen width with 1 to 1-1/2 times the screen width, and no visual obstructions, like columns or podiums, between student seating and the instructional end of the room.
- Glare – The factors have to be taken in to consideration when designing the classroom to prevent glare includes glare from the overhead lighting causes distractions to learning, the contrast ratio for the student viewing area of the front of the room shall not exceed 3 to 1, a light meter is to be used to check this in new and renovated construction in a three-row three column matrix at the front with contrasts recorded and noted for correction, and higher density reflective louvers in recessed lighting fixtures have to be used to reduce the above problems.

When discussing the learning environment and its effects on learning, the main focus should be on the learning and teaching process. Patel (1995) advocated that the teaching and learning process is a highly complex process in a real world situation. Especially in an undergraduate university level primarily because the recipients have to replace their learning paradigm followed in the secondary schooling. The undergraduate level has been considered more liberal and gives more freedom in contrast to the secondary schooling which is conducted within tightly controlled environment.

The Design Guidelines for learning spaces of Maricopa Community Colleges stipulates that:

“Learning is not a spectator sport. Students do not learn much just by sitting in class listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves.”(Maricopa Community Colleges, 29,09,06).

The design guidelines also support “active learning” mode of instruction, which involves reading, writing, discussion and engagement in solving problems, analysis and evaluation and they also claim that the research shows greater range of students are engaged in effective learning by the active learning process. The main criteria of the active learning process are students should be able to see anything that is presented visually, students should be able to hear anything that is presented audibly, free from noise and distortion, and students should be comfortable in their learning environment, including air flow, room temperature and proper furniture.

4. The Proposed Methodology

The aim of this research project is to study the higher education formal lecturing space and its relationship with the learning as such. In addition, it is also intended to study the learning process and the need, importance and possibilities of creating a creative, sensible and an ‘intelligent’ learning environment that is more interactive and responsive to the users within the space. Furthermore, the study also investigates how can such an improved space possibly enable and enhance the effective learning of the user in a higher education formal lecturing classroom.
In order to achieve the aim and objectives of the research, the investigation is strategically carried out by first analysing the learning environment and the various entities within it under the principles of who, what, when, where, and why principles that constitute to functioning of the space following Walters (2006). The research methodology designed for this research project conform with the scientific and deductive approach which comprises of five steps, namely the purpose, theory, research questions, methods and sampling strategy (Robson, 2002). This deductive approach starts with a realisation of purpose followed by a very broad area to study and gets narrowed when each and every step is completed one by one. The theoretical study is facilitated through a thorough literature study to help attain the conceptual model that can be used as the research framework. Following the literature study, the transitional model for teaching and learning (Huitts, 2003) was found significantly relevant and will be used as the platform to develop a framework of the relationship between the learning space and the learning process. In parallel with the literature study, a pilot questionnaire will be circulated to the main stakeholders of a teaching and learning process, i.e. students and lecturers in a higher education institute. This pilot questionnaire is intended to enrich the understanding of teaching and learning process and the role of space in such a process. At the moment of preparing this article, the pilot questionnaire is planned to be distributed to at least 100 respondents.

The next stage of the research involves three processes namely questionnaires, interviews and observation. At this stage, detailed questionnaires will be administered to elicit quantitative information about the learning space and what the users expect from the learning space to support teaching and learning process. The detailed questionnaire will be distributed to the main stakeholders of the teaching and learning process, i.e. students and lecturers in higher learning institutions. The detailed questionnaire aims to determine the key factors in designing a learning space. In parallel with the questionnaires distribution, interviews will be conducted with students and lecturers. The interviews are expected to obtain in-depth qualitative information about the learning space from both the teachers and students’ perspectives, the psychological effects that the space has on the various users, to understand the teaching and learning process, behavioural aspects of both the lecturers and students with respect to the learning space. The interviews aim to complement and contextualise the findings from the detailed questionnaire. In addition to the detailed questionnaire and the interviews, the interaction between users with and within the space will be studied by conducting direct observation. The observations are expected to supplement the findings on behavioural aspect and the learning process of the user within the space. Direct observation technique can be expected to enrich the findings by including factors that were not revealed in the detailed questionnaire and interviews as they may be subconscious to the respondents. At the moment of preparing this article, the detailed questionnaire is planned to be distributed to at least 300 respondents (assuming 10% response rate) whilst the interviews are planned to be conducted with at least 12 students and 12 lecturers of higher education institutes. Direct observations on life lecture sessions are planned to be conducted on at least 3 different types of classroom for formal lecture sessions, one to represent relatively small class rooms, one to represent medium or large classrooms and one to represent theatre type classrooms.

The final stage involves analysing all the collected data from the three processes mentioned. The quantitative data from the questionnaires will be analysed to determine key factors in a designing learning space. The qualitative data from the interviews will be manually analysed to contextualise and provide reasoning to the determined key factors in regards to teaching and learning process. Findings from the direct observations of life lecture sessions will be
used to enrich the findings with factors that may be subconscious to the respondents (and hence were not extracted in the detailed questionnaire and interviews). The final findings are expected to enhance the current understanding on the teaching and learning process, the extent of influence from the learning space towards such processes, and the factors key in designing a learning space that supports such processes. Figure 2 shows the diagrammatic flow of the proposed research methodology in tackling this research.

![Diagram of research methodology]

**Fig. 2. The proposed research methodology**

### 5. Conclusion and Further Research

In accommodating certain activities that involve human ‘creativity’, such as the teaching and learning, studies have identified other characteristics that can be equally important to (if not more important than) the ‘regular’ characteristics whilst these other characteristics are often difficult to articulate and quantify. Reviews on the teaching and learning process have demonstrated the significant influence of the environment, including space, on the process. In response to that, a research project has been set to conduct a study on the relationship between the learning environment and the learning process, how a learning space affects learning and the possible needs importance and opportunities to develop a creative space for learning, which is vibrant, dynamic, intelligent, interactive and responsive to the human emotions and senses. The scope of the investigation is set within the higher education formal lecturing environment. This paper presents an initial review on the teaching and learning process and the impact of the environment such as the learning space on such a process. Following this, a methodology to conduct this investigation has been developed and presented. The methodology presented is considered robust and capable of achieving the aim and objectives of this research. Further research involves a continuous literature study, followed by a pilot questionnaire to develop a conceptual model/framework. Further stages involve detailed questionnaire, interviews, and direct observations. Final findings will then be drawn from analysing the data acquired from these processes.

### References:


