Environmental Impact on Design Education

Grace Lau K.

City University of Hong Kong, School of Continuing and Professional Education
Hong Kong, bskbglau@cityu.edu.hk

Abstract: Literature review indicates that environment has strong link to improving achievement in learning, and design studio as a form of pedagogy that effectively integrates knowledge joining theory and praxis (E. Boyer & L. Mitgang, 1996) is increasingly adopted by different disciplines. This paper uncovers the ‘pentagonal effect’ of curriculum, resources, communication, teaching practices, plus ‘environment’ of design institutions to determine how relevant can the setting of a studio together with other factors foster rigor in learning. The study focuses on the aspect of ‘environmental impact’, exploring into changes of studio setting, interaction between students and objects within, as well as the interplay of functions between objects and the environment. The analysis using a case-study method aims to discover the meanings and values conveyed through objects that drive emotional attainment, and the underlying dynamics of which contribute to ultimate ‘Design Education Experience’.

Key words: Design Education, Spatial Design, Physical Function, Emotional Function, Learning Effectiveness

1. Introduction

Design education is being viewed as an agent for change over the last ten years. The study of design education has always been concentrated on four major areas – 1) the structure of the curriculum and projects (Torrance, 1981; Sanders, 1992), 2) the allocation of resources (Robson, 2002), 3) the mode of delivery (Torrance, 1981), and 4) the teaching practices (Green, 1974). But when practicing designers in the user-centered production age are working hard at creating a total experience (relying heavily on emotions) to product and service, design educators should start looking at design education the same way since it is in fact a product cum service which has a strong emotional involvement. So if the above-mentioned areas resemble the features of design education as a product, and if the packaging of a product and the retail space where the sales takes place are the keys to driving emotional attainment; the learning environment is therefore analogous to the packaging and the retail space of design education. In other words, environmental factors play a role in complementing the overall learning experience of design education. In Hong Kong, most students enter a design programme from traditional high schools with little or no knowledge of what learning design and doing design is about. Not only that they are overwhelmed by the way of learning design, they also feel disoriented in design studios – the setting of studios differs a lot from traditional classrooms. A survey conducted in 2007 by the Programme Team of the Associate of Arts in Digital Visual Design (AADVD) of the Community College of City University of Hong Kong shows that 72% of freshmen associates negative emotional descriptors, such as ‘unpleasant’ and
‘lost’, with the studio learning experience in the first year of studying. But the survey also indicates that 87% of students, during an interview in the second semester of the first year of studying, agrees that the studio experience helps them adapt to the mode of teaching and learning. The results suggest a relevant connection between environment and the learning experience.

This paper aims to discover the impact of environment on learning by exploring beyond the usual periphery of environmental study such as ambience, lighting, and noise etc.; looking into possible emotional functions of objects within, and the interaction of such with students and the environment.

2. The Study

2.1 Research Protocol

The research is divided into two phases. The first phase includes literature review and analysis of learning experience, classroom setting, cognitive/learning effectiveness, and creativity. The second phase involves a case study approach through observation, documentation and explanation of four groups of design students from three different institutions in Hong Kong who belong to the 70’s, 80’s, 90’s and the Millennium era. The institutions are chosen to include design programmes of different levels, and with a variety of studio settings.

2.2 Foci of the Study

The study has two areas of focus. The first is to identify and describe the different features and setting of the physical environment of studios in the selected institutions, and how they have changed over the years through a comparative analysis. The characteristics of the physical environment examined in the study include scale, functionality, relationships, patterns and activities. The second area of focus is to understand the dynamics of the relevant factors within the learning environment of a design studio which answer the following questions:

a) What do the objects mean to the students and what are the emotions evoked by them?
b) How can the different objects in the environment serve as stimulus for enhancing learning?
c) How does the achievement of students relate to the learning experience?

3 The Pentagonal Effect in Design Education

The model in Fig. 1, developed from the conceptual framework of interacting elements drawn up by the Design Council of UK, illustrates the ‘Pentagonal Effect’ of design education.

Figure 1 Pentagonal Effect of Design Education
The model shows learning as the core that acts as the bridge for the five factors - curriculum, resources, communication, teaching practices, and environment; and the interaction of which affects the outcome of student learning as well as that of programme-level.

Traditional modes of professional design education are material and product-based, and training is in the craft of solving problems with the information immediately at hand. The learning outcome in that respect usually refers to a particular set of design/technical skills or a tangible form of ‘output’. But the recent development in design profession that involves a major paradigm shift in the focus of the design process from objects to experiences, demands new knowledge and wider responsibility from designers. Jones (1970) asserts that the problems of contemporary society are defined at the level of systems and communities; that design action must address an intricate web of connections among people, activities, objects, and settings. So to nurture designers who are good enough for the new era, new models for design education and related programmes are being developed by institutions around the world that focus more on contextual training which drives design research. Thus the description of the learning outcome also changed from something tangible to a more objective set of ‘intentions’.

The Bachelor of Design programme jointly delivered by School of Continuing and Professional Education (SCOPE), City University of Hong Kong and Faculty of Design, Swinburne University of Technology has evolved over the last five years in view of the paradigm shift. Study units of the programme are becoming more knowledge-based that focus on design research and contextual studies. For example, new units like ‘Design Systems and Services’, which invites students to study into design systems and produce recommendations for system solutions, replaces old ones like ‘Managing Design’, which requires students to produce a set of design deliverables. The overall aim of the Programme has also been revised. The Programme Intended Outcomes (PILO’s) of teaching and learning, adopted in 2008 in reference to the newly adopted Outcome-based Teaching and Learning approach (OBTL), suggest that a student on completion of the programme should be able to:

a) acquire a systematic and coherent body of knowledge, the underlying principles and concepts and the associated communication and problem-solving skills
b) develop academic skills and attributes necessary to undertake design research, comprehend and evaluate new information, concepts and evidence from a range of sources
c) develop the ability to review, consolidate, extend and apply the knowledge and techniques learnt, including in a professional context
d) gain a foundation for self-directed and life-long learning
e) gain interpersonal and teamwork skills appropriate to employment and/or further study.

Using the PILO’s from the Programme as an example to understand how outcomes relate to the factors of the ‘Pentagonal Effect’, Fig. 2 shows how each of the individual outcome matches up with the different factors.
Figure 2 Matrix Matching Learning Outcome with Factors

The matrix indicates that most factors correspond to more than two outcomes, and vice versa, each outcome is driven by at least three factors; the relationship clearly indicates that the casual influence in each factor relates to some others. The matrix also shows that out of the five factors, ‘environment’ is the one that is accountable for driving and enhancing all the outcomes, suggesting that environmental impact of learning environment requires a lot more attention. Literature review shows that there is in fact a growing interest on studying how environment impacts learning effectiveness. Green (1974) states that design education is fundamentally influenced by the environment and not the hardware. Areti (1976) stresses that creative act (the spirit of design education) cannot be judged without the references of environmental factors. Steinberg and Lubart (1995) also emphasizes the environment stimulation is crucial for creative enhancement in design education. The model in Fig. 3 shows a revised framework that gives ‘environment’ a three-dimensional characteristic; which the four other factors - curriculum, resources, communication, and teaching practices, are wrapped around by ‘environment’.

Figure 3 Three-dimensional Model of Pentagonal Effect

The new model illustrates how environment works as the ‘force-field’ that encases the other factors, and provides a dynamic context for allowing further interactions of the four factors to foster rigor in learning so as to enhance learning outcome.

4. Classroom Setting and Learning Effectiveness

Weinstein (1979) in her review of the effects of physical environment in education concludes that ‘weight of the evidence suggests that design features (of classroom) can have a significant influence on students’ general
behavior … and on their attitudes’. Moore & Glynn (1984) and many authors in the 80’s and 90’s, have already pointed out the direct link between the environment and student attitudes through the values and assumptions implied by particular setting inside classrooms. Physical elements in the teaching environment are clear to have discernible effects on teachers and learners, and with growing concerns for emotions in design of products (Cohen and Areni, 1991), spaces (Schmitt, 1999) or simply a piece of advertising, emotional consideration for learning environment starts to draw researchers’ attention.

A study conducted by the UK Design Council in 2005 indicates that ‘ownership’ of space and equipment by both teachers and students is important, and that ownership and engagement are ongoing elements that have to be well balanced for promoting learning and improving achievement. Ahrentzen & Edward (1984) state that by arranging furniture to produce private areas can help students to create a better sense of belonging, hence improve learning, in the learning environment. Hickey (1999) believes that classroom environment can provide a supportive, comfortable and welcoming atmosphere to individuals in order to encourage them to be cooperative and enthusiastic about learning. Addison and Burgess (2000) also stress that individuals are being motivated easily by a well-structured and stimulated learning environment. Therefore, a multidimensional, simulative and interactive environment is crucial for enhancing students’ cognitive/learning effectiveness.

4.1 Design Studio and the Rise of Studio Pedagogy
While the science of designing learning environments has starting to draw more attention from educators, it is acknowledged that time-honored pedagogies of problem-based and studio-based approaches offer a better way to instill innovation and creativity (Karmel T., 2004) in contemporary learning. The design studio has been the centerpiece of design education for over a century and a half. The setting and arrangement within foster the dynamics for learning and the social-cultural stimulations, which resembles the enlargement of the human experience in a creative act (Areti, 1976). The studio is in fact more than just a place (or space) for learning, as itself is growing to become a form of pedagogy. Studio pedagogy adopts multiple intelligence theory (Lazear, 1992) that combines different methods of learning, including logical, visual and verbal. Students are actively engaged in a variety of activities that relate the methods described above, and are invited to participate in active learning through exploration, information gathering and decision making. The modes of thinking throughout the studio process are analytical, synthetic, and evaluative, and students collaborate frequently with each other; thus allows students to take up the responsibility to critique one another and provide each other with objective comments and suggestions. Ernest Bayer and Lee Mitgang (1996) identify the studio as an educational paradigm, and an effective setting for integrating knowledge which is key to training designers who need to be able to reflect and apply knowledge gained during the process of learning. All in all, Studio Pedagogy reflects the balance of emotional and physical functions, and embraces the qualities of a simulative and interactive classroom setting.

4.2 Environmental Factors and Creativity – the basics between human and space
Creativity is any act, idea, or product that changes an existing domain or that transforms an existing domain into a new one. So in order to be creative, one needs to be able to view things in new ways or from a different perspective and to be able to generate new possibilities or new alternatives. Rollo May (1967) suggests that “it is
an experience of heightened consciousness—ecstasy”, and it happens in a place that one can have the mindset to develop the ecstasy. Philosopher William James (1842-1910) initiated a series of study into defining the relationships between human creativity and environment in the late 19th century, which triggered further studies (Vygoskky, 1978; Amabile and Gryskiewicz, 1989; Fisher, 1993; Sternberg and Lubart, 1995) that somehow demonstrated that ‘environment’ does play a vital role in facilitating one’s creative thinking processes. Edward (2000) also suggests that individual’s creativity is strongly related to his/her knowledge and the environment in which they operate in.

In 2008, the researchers at Swinburne University of Technology had worked together with interior designer Mary Featherston to redesign classrooms for a group of high school students. The new learning space brings together settings found in traditional classrooms with ‘specialist’ areas such as a drama space, games area and art room, and students are free to move around during class time to look for information or to work with other members in the class. It appears that the designs have had a positive impact on independent learning as a recent study conducted by the Victorian Department of Education and Early Childhood Development suggests that these students are much more independent learners than students from a more traditional schooling background.

In conclusion, a multi-dimensional environment that invites students to construct their own knowledge and to develop one’s own value judgment towards issues can help to stimulate creativity and promote creative learning.

5. Analysis, Synthesis and Insight from Case Studies

Data collected from the multiple sources are organized by period and then by categories. The data are then analyzed by time period to identify the objects and their meanings, as well as the emotions and values which they underpin. The findings put forth both qualitative information and quantitative data that compares different forms of interaction in the studio of different periods which reflect their contribution to learning development and pedagogy effectiveness as demonstrated through level of outcome.

5.1 Studio Setting – arrangement and layout for functional purpose

This part of the study mainly concentrates on physical setting of studios, and the comparative study discusses the different experiences of the students during different periods and in the different institutions. Fig. 4 shows the photo of the setting of design studios in the 70’s and 80’s. During the two decades, given that student number to amount of space is relatively smaller, each student is able to have their own workstation. The studio is mainly used for students to work on their project after the lectures, while tutorials are usually conducted in the staff room. Since the programmes then focus on technical skills, the drafting tables provide the students with the required amount of space to work on large technical drawings.

Figure 4 Studio setting during the 70’s and 80’s
Fig. 5 shows design studios of the 90’s and that of the Millennium. Studio-setting of the two periods adopt an open plan design as design schools believe in promoting participatory learning during those times. Private workstations no longer exist in studios starting early 90’s as number of student to amount of space increases. Large tables replace private workstations, and it is also common for some institutions to zone up corners of the studio for different purposes so that multiple activities can take place simultaneously. And with the growth of computers, technical drawings and other graphics renderings are being done on computers located in design labs, freeing the studios up for students to work together in groups and for tutorials.

![Figure 5 Typical studio setting of the 90’s and the Millennium](image)

Table 1 in Fig. 6 contains information of the comparative study conducted on the studios based on: a) scale – compares the number of students to the floor area, b) function – refers to the intended use of the studio, c) relationships – defines the relationship of the student and the environment, d) pattern – notes the setting and arrangement of furniture, and e) activities – records the kind of things students do in the studio.

<table>
<thead>
<tr>
<th>Institutions and Year</th>
<th>Award Level</th>
<th>a) Scale</th>
<th>b) Function</th>
<th>c) Relationships</th>
<th>d) Pattern</th>
<th>e) Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>HKPU School of Design 1978</td>
<td>Higher Diploma</td>
<td>30 pax to approx. 2,000 sq. ft.</td>
<td>Student to work on their projects</td>
<td>Personal</td>
<td>Individual workstations with pedestal</td>
<td>Work, eat, play, listen to music</td>
</tr>
<tr>
<td>HKPU School of Design 1985</td>
<td>Bachelor Degree</td>
<td>50 pax to approx. 3,000 sq. ft.</td>
<td>Student to work on their projects</td>
<td>Personal</td>
<td>Individual workstations. Plus a shared area with large paper cabinet</td>
<td>Work, eat, play, listen to music, exercise</td>
</tr>
<tr>
<td>HK Institute of Vocational Training 1999</td>
<td>Higher Diploma</td>
<td>50 pax to approx. 1,000 sq. ft.</td>
<td>Teaching and Tutorial</td>
<td>Public</td>
<td>Large workbenches with stools</td>
<td>Tutorials, discuss projects</td>
</tr>
<tr>
<td>SCOPE, City University of Hong Kong 2008</td>
<td>Bachelor Degree</td>
<td>30 pax to approx. 1,500 sq. ft.</td>
<td>Teaching, Tutorial and for students to work on their projects</td>
<td>Public</td>
<td>Large worktables with stools. Plus common area with small round tables and chairs</td>
<td>Tutorials, discuss projects, eat, search internet</td>
</tr>
</tbody>
</table>

Figure 6

The findings shown in Table 1 indicate that with the change of setting, there is a major difference in the relationship between the students and the studio. In 70’s and 80’s, students establish their own workstations and they have a more ‘personal’ relationship with the studio; and there is a stronger sense of ownership of the environment. With studios adopting an open-plan after the 90’s, students interact more with each other as tables and a lot of things have to be shared; the relationship is more ‘public’. The establishment of ‘shared corner’ in studios of the Millennium actually helps to create an environment that allows students to work with each other, which better prepares them for working in the industry upon graduation.
The change of setting also shows a difference in the kind of activities that take place. More personal activities, apart from work, take place in studios that support more ‘personal’ relationship with students. There also seems to be differences in student involvement dependent on the setting of the studio, as indicated by the number of hour student stay and work in the studio. In average, students in the 70’s and 80’s period stay for ten to twelve hours day in the studio, while students in the 90’s and in the millennium stay for only four to six hours a day in average. And with tutorials conducted within the studio area actually make students feel less attached to the environment as the space provides minimal privacy; even with the zoning. The different settings seem to have varied effect on facilitating communication between students, and promoting positive emotional alignment and sense of belonging. Open-plans tend to better promote interaction and build up sense of belonging as a group for the particular cohort of students; while workstation gives better sense of personal belonging and ownership of work produced, yet reduces interaction and chance of cross-influence between students. The setting of the studio also cultivates particular culture amongst the students of the different periods, and each group shows traits of some sort of collective behavior similar to the characteristics of a community. The students of the 90’s and the Millennium adopt a ‘tribal’ culture, as they tend to act more in groups. While the students of the 70’s and 80’s tend to belong to a more ‘closed’ culture, as they are less confine to group behavior.

The findings do not indicate a definite preference of one particular setting over another, but rather, the possible combination of settings that on one hand be able to foster healthy social interaction (Loo, 1972), and at the same time be able to provide places for student privacy (Moore, 1986); which then together facilitates and maintains an appropriate level of sensory stimulation as a multidimensional learning environment.

5.2 Objects and People - Interaction and Interactivity in an Emotional Perspective

The analysis in this section is built upon the model used in the ‘Symbolic Interaction Theory’ (LaRossa & Reitzes, 1993), and the findings aim to show how design students assign meanings to symbols within the studio and create a context for the environment. The study through observation shows a studio environment contains major types of objects that can be categorized into: a) personal objects, b) acquired objects, c) equipment, and d) furniture. Table 2 in Fig. 7 shows part of a list of personal and acquired objects, equipment and furniture found in the studios, and the emotional descriptions the students assign to some of the objects.

<table>
<thead>
<tr>
<th>Table 2. Objects, Emotions and Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object Categories</strong></td>
</tr>
<tr>
<td>a) Personal</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>b) Acquired</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>c) Equipment</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>d) Furniture</td>
</tr>
</tbody>
</table>

Figure 7
Objects are symbols that represent one’s presence, and the owner and other people form relationships around them and with them. Personal objects like flip-flop and stuffed toys are symbols of identity means a lot to the student as they define their existence and values. Positive emotions are evoked by both personal and acquired objects, while students do not express any emotions and cannot relate any meanings to equipment and furniture. Students interact with the equipment and furniture more during work hours, and when they choose to rest or during after ‘official’ work hours, they choose to interact with their personal and acquired objects; which provide them with positive emotional attainment. The objects redefine the space in the environment, and the meaning of working and learning within it. By placing personal objects in the studio, students turn an alien ground into a personal and familiar environment that they can feel more comfortable in, and be able to free their minds. Personal objects also help to increase the students’ knowledge of the studio environment. It is clear that students of the 70’s and 80’s have stronger feeling for the studio as they tend to stay longer working in it, while students of the 90’s and the Millennium are less emotional attached to their studios.

The findings show that personal objects that a person can bring along or relate to in an unfamiliar environment can help to convert negative emotions to positive ones. Positive emotions give a space its value, and physical environments contain and communicate shared symbols and meanings (Gieryn, 2000) of people it contains. Therefore it may not be important to recreate workstation for individual student in studio environment in considering the growing number of students to space available, but by allowing students to have an area to display objects that reflect themselves as individual can help to achieve emotional attainment; and positive emotions can act as stimuli for enhancing learning.

5.3 Learning Outcome – Measuring Effectiveness of Environmental Impact

The exploration of the impacts of environments on learning effectiveness of the design students is conducted by reviewing a samples of student folio collected from the selected institutions. The collection include work of students from across the different periods. As suggested in Section 4, an effective environment should promote positive attitude of students, and that the environment should support creativity. Given that the programme level is not the same across, ‘positive attitude’ and ‘creativity’ are the two criteria used in the assessment in this case for reviewing the folios collected. The initial assessment is averaged out with comments collected from professionals from the local industry. While the folios show very different styles, the analysis indicates that all folios show high level of creativity and professionalism, and the achievements of the graduates are well recognized by the schools as well as the industry. The differences in style of work could be result of the change in curriculum and other factors, so it may not be accurate to compare them directly with each other. And although there are differences in setting and size of the studios selected for the study, they all meet the requirement expected of an efficient learning environment to some extent. The studios of the 70’s and 80’s sufficiently provide the students with a comfortable atmosphere, while the studio of the 90’s well supports interactive learning; and the open-plan studio of the Millennium encourage cooperation and interaction between students. So to say, the different settings all have significant influence on students’ general behavior and culture, and on their attitudes and emotions; and there shows a direct relation between achievement and the impact of studio settings in individual cases.
6. Conclusion

Heerwagen (1998) raises out that human used to seek both physical and psychological comfort and she indicates that some elements must coexist to create positive and productive places: cognitive effectiveness, social support, emotional functioning and physical function. She states that if people cannot feel comfortable and build up a sense of well-being, they cannot concentrate. Caine’s (2005) 12 Brain/Mind Learning Principles also points out that good space design is visually stimulating and the space can provide sensory stimulation to influence the experience of learning. While environmental impact of learning environment involves multi-facet considerations, the study reveals that ‘emotions’ deserve increasing attention. The study also indicates that an ‘ultimate design education experience’ is defined by the dynamic interaction of objects, the environment and the students, as conceptualized by the model in Fig. 8.

![Figure 8 Conceptual Model of Interaction]

The interaction fosters the development of a particular (learning) culture amongst the students, and the cultural representation of the group embodies the values of the group; which directly affect the kind of experience individual student can get from learning in that environment.

7. References