The role of healthy social interaction and communications in provoking creativity in the design studio

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ABSTRACT
Design is a social phenomenon and researchers suggest that negotiations and communications between designers are essential to initiate creativity. Within the design studio environment, a number of factors affect the healthy social interaction and design negotiations, such as the teaching style of tutors and the culture that governs a design studio environment. This may, in turn, affect the utilisation of the outcome of negotiations in the design project. Design studio students from the third to fifth years at the College of Architecture, UoD were surveyed to find out how far the design studio culture and communications would impact on the production of innovative design projects. The results show that democratic communications and establishing common grounds are essential to develop knowledge and would influence positively the design outcome. On the other hand, the research found that negative personal and design studio environment's qualities would hinder students' creativity. However, to develop students' design/innovative abilities, the researcher recommends that certain measures should be considered. These would include shifting the focus of architectural design pedagogy from the production of solution-based to innovative-based design projects, transforming the design studio into an interactive and friendly learning environment and the development of interactive and communications skills of tutors.

KEYWORDS
Creativity; innovative projects; design negotiations; creative environment

Introduction
Architecture studio education involves a number of varied activities. Before the project begins, the tutor(s) may establish the goals, expectations, general procedure and assessment criteria he/she will employ for the project. During each semester, tutors meet students either individually or in groups for design-related discussions and clarifications. The design studio should not be considered a safe haven – as one would imagine – as conflicts regarding design ideas are very likely to take place between students and tutors and between tutors themselves. This research is driven by growing complaints from the design studio tutors and the discussions of the board of the Department of Architecture, College of Architecture,
UoD about the low design abilities of students. Tutors from all academic levels repeatedly claim that students produce design projects but very few of them can actually produce innovative projects (The author, 2009, Personal contact, 2009).

Previous research points out possible causes that influence educational outcome and indicates that in many instances, the teacher serves as the ‘fount of knowledge’ and the students are the empty, open containers anxiously waiting for knowledge to be poured in. Conversely, teachers may tend to be autocratic, repressive, and do little to encourage individuality and creativity, and many classrooms lack democracy and students fear their teachers (Davis, Kogan, & Soliman, 1999). Researchers mentioned that the architectural design pedagogy has incorrect focus and suffers from programmatic and contextual context problems (see for instance Salama, 2005). There is poor understanding of creativity dimensions and how to implement it in the architectural pedagogy (Ostwald & Williams, 2008a, 2008b).

On the other hand, interactive and creative skills play an essential role in initiating/fostering creativity (Casakin, 2007; Johannessen & Olsen, 2011), thus the absence or the shortage of these skills would diminish creativity. A number of approaches have been suggested to improve the design studio education. Edmonds et al. (1999); Fischer (2003), Mamykina (2002) and Shneiderman (2000) have put emphasis on collaboration and the social interaction/dialogue to initiate creativity. Paker (2007) suggests that the role of the studio tutor is to create an organisational style in studio education and this would help in developing creative strategies in the design studio. This encourages educators to spark creative ideas, encourage follow-up of creative ideas, and evaluate and reward creative ideas (Sternberg & Lubart, 1991). Parkinson and Robertson (1999) suggest the Olympic model that consists of personal and environmental components and this model can be used in establishing effective communications and development of creative individuals. This research explores the social factors that would hinder/support the production of innovative design projects. It examines how these factors interact within the design studio environment to impact creativity.

Creativity and the design studio

Creativity and creative design projects’ definition

The term ‘creativity’ is used to reflect a psychological view of creativity on a personal level, in contrast to innovation as used in the world of business on an organisational level (Sternberg & Lubart, 1999). Innovation traditionally focused on products and processes. Hargreaves (2000) suggests that ‘you can have creativity without innovation, but you cannot have innovation without creativity’. Warr (2007) examines the work of a number of researchers such as Eisenberger and Cameron (1998); Ford and Harris (1992); Starko (1995) and Sternberg (2001), and points out that there was no definite consensus regarding how creativity is defined. He finds that the creative process looks different to different researchers (see also Isaksen & Treffinger, 1985; MacKinnon, 1978; Osborn, 1963; Wallas, 1926). There is general agreement among researchers that the act of creation does not occur at a fixed point in time, but that it manifests as a process that extends through time, varying in duration (Ford & Harris, 1992). Rogers (1995) defines an innovation as ‘an idea, practice, or object that is perceived as new by an individual or other unit of adoption’. Diffusion is ‘the process by which an innovation is communicated through certain channels over time among the members of a social system’ (Rogers, 1995).
Mumford (2003) defines creativity as the production of novel, useful products. In the fields of art and literature, originality is considered to be a sufficient condition for creativity, unlike other fields where both originality and appropriateness are necessary (Amabile, 1998; Sullivan & Harper, 2009). So can we define creative architectural projects as the production of novel, useful and original architectural projects? Such definition may look too general. Within the design studio context, the definition of creative architectural projects would be distinguished by the goals/objectives and outcomes of the design studio course. Gero and Maher (1993) argue that ground-breaking designs are those which possess innovative and creative qualities, and provide solutions that were previously unknown (innovative design) or subsequently produce entirely new products (creative design). To find out the features of creative design within the design studio context, a small survey was undertaken by the present researcher in 2009 of the design studio tutors and students to find out the importance of a number of design features in considering an architectural project as innovative. The survey showed that the important aspects – arranged from more to less important – are as follows (see Table 1):

- a creative functional solution;
- a solution that is in harmony with the climate and environment;
- a design solution that effectively addresses building users’ needs;
- successful response to the site parameters;
- aesthetic treatment of plans, elevations and form;
- a design solution that considers other design aspects such as user safety and security;
- a level of integration and harmony between the 3D components of the form;
- unique structural solution; and
- a design solution with a high economic value.

The tutors, however, set more emphasis on all design aspects than students, and the difference in the importance weighting between students and tutors is not always the same. This may cause possible conflict between students and tutors as each party has his view regarding the creativity weighting of each design aspect. However, different outcomes would result if the same survey was conducted in other Colleges of Architecture around the world.

| The design feature/Aspect | Student survey (Mean value) | Tutor survey (Mean value) |
|---------------------------|----------------------------|--------------------------|
| A creative functional solution | 3.79 | 4.40 |
| A solution that is in harmony with the climate and environment | 3.75 | 4.33 |
| A design solution that effectively addresses building users’ needs | 3.54 | 4.33 |
| Successful response to the site parameters | 3.65 | 4.13 |
| Aesthetic treatment of plans, elevations and form | 3.70 | 4.07 |
| A design solution that considers other design aspects such as user safety and security | 3.32 | 4 |
| A level of integration and harmony between the 3D components of the form | 3.43 | 3.93 |
| Unique structural solution | 3.48 | 3.87 |
| A design solution with a high economic value | 3.69 | 3.87 |
| Other aspects | 2.56 | 3.5 |

Note: Scale: 1, not important; 5, extremely important. Number of students 48 and number of tutors 15.
so what is considered as the most creative design aspect here would not be considered to have the same creativity weighting elsewhere!

**Potential hindrances and initiators to creativity**

**Architectural design pedagogy**

One would suggest that the production of creative design projects is affected by the learning/teaching styles. There are a number of teaching/learning styles suggested by researchers (see, for instance, Kolb, 2000; Riding, 2002) to initiate the exchange of knowledge between the student and the tutor. It is also important to develop teaching approaches that consider students as active learners and not as passive listeners (Salama, 2009). Coffield, Moseley, Hall, and Ecclestone (2004), however, pointed out that there is no uniform teaching pedagogy in higher education as there are substantial differences in the pedagogical language and theories used in higher education. Also, there is very little interaction between these differing approaches (ibid.). Within the context of architectural education, it is stated that the quality of the teaching and learning processes depends on the ontological dimension of how architecture is defined and on the epistemological dimension of how knowledge about architecture is construed (Yanar, 2007). The architectural design pedagogy however focuses more on form issues, while oversimplifying programmatic and contextual contexts within which buildings are created (Salama, 2005). These studies suggest that the use of conflicting and unrelated teaching styles in the design studio and the incorrect focus of the design teaching would diminish creativity. On the other hand, the sociocultural diversity of most architectural projects possesses many hidden dimensions. These hidden dimensions are usually not covered within the realm of course contents. The Hidden curriculum is the tool of choice (Dutton, 1991), thus it is a way of delivering design values and virtues in a more subtle manner. So it is suggested that much of what is learnt in the studio is hidden by the its’ structure, but is still tacitly understood by the students (Dutton, 1991).

Ostwald and Williams (2008a, 2008b) explore the relationship between creativity and design education. They identify three key problems related to creativity and design education: firstly, there is a lack of understanding of the pedagogical dimensions of creativity in architecture and design; secondly, there is a lack of appropriate strategies to understand where different levels of creativity occur and how they should be assessed; and thirdly, there is a lack of appropriate models or tools to support the assessment of the creative component of design. The student participants in the study argued that over-defined learning and assessment outcomes stifle ‘their opportunities to be creative and that teachers fail to recognise their creative efforts’ (Ostwald & Williams, 2008a).

**The style of communications and design approach**

Within the professional context, it is suggested that the cultural communication secures the exchange of experiences, the learning outcome and the creativity in the project and this is a function which is strongly de-emphasised in project contexts, both in the literature and in practice (see Ekstedt, Lundin, Söderholm, & Wirdenius, 1999). Social communication is meant to balance stability and change in order to promote dynamism and creativity (Johannessen & Olsen, 2011). The development of an architectural project from the initial concept to the end product is an interactive social and psychological process. Gennari and Reddy (2000) describe the design process as ‘human activity, involving communication and
creative thought among a group of participants. Education in the design studio stimulates its characteristics by the nature and process of architectural design. Through this process, the designer negotiates various solutions of the design problem with himself/herself and communicates ideas with colleagues and tutors. Lawson (2006) points out that the design process is a simultaneous learning about the nature of the problem and the range of the possible solutions. The designer repeatedly evaluates and alters the design scheme and returns back to the previous or to the start stage to find/test a solution for the whole or a part of the design scheme.

Lawson (2003) argues that experienced designers see some kind of underlying pattern or theme and made connections in a design situation (between design aspects) and also make a connection with some precedent in the episodic memory more than inexperienced designers do. Expert designers acquire knowledge about solutions rather than necessarily about problems (Lawson, 2003). This design approach style would initiate creativity as ‘it is probably commonly accepted in design that creativity involves making use of solution ideas from apparently superficially different situations’ (ibid.). Casakin (2007) argues that designers should explore unfamiliar and unconventional design solutions. However, they need creative skills that enable them to transcend conventional knowledge domain(s) so as to investigate new ideas and concepts which may lead to innovative solutions. This enables the designer to perceive a problem from unorthodox and innovative perspectives (Casakin, 2007). When conventions are challenged, design moves from routine solutions towards innovative, non-routine solutions. Though design activities encapsulate the spectrum from routine to non-routine design, the ground-breaking designs are those which possess innovative and creative qualities; that is, design that changes the design variables in such a way that the results are solutions that were previously unknown (innovative design) or design that introduces new variables and that subsequently produces entirely new products (creative design) (Gero & Maher, 1993).

**The design studio culture**

Creative environments are generally described as organisations that enable the production of knowledge and facilitate learning from experience and from one other, thus providing knowledge sharing (Parkinson & Robertson, 1999). Ekvall (1991) suggests that broad requirements for a creative climate include:

- open, participative culture (rather than suspicious, closed);
- having an idea-handling system;
- whole workforce involved in idea generation;
- whole organisational endeavour (though pockets of creativity can emerge and survive);
- experiment-encouragement;
- forgiving culture, patience with failure, trust;
- conflict-handling through debate and insight rather than warfare;
- networking and sharing systems;
- system of incentives;
- multidisciplinary working;
- research and development investment, and
- some champions (for any change but particularly for newer ideas).
### Table 2. Existing hindrances and potential initiators to creativity in the design studio.

| Design studio's criteria | Existing hindrances                                                                                                                                                                                                 | Potential initiators                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| a. The design studio’s pedagogy and approach to design | There are differences in the pedagogical language and theories used in higher education (Coffield et al. 2004)  
The architectural design pedagogy focuses more on form issues, while oversimplifying programmatic and contextual contexts within which buildings are created (Salama, 2005)  
Architectural design pedagogy has incorrect focus and suffers from programmatic and contextual context problems (Salama, 2005)  
Socio-cultural diversity of most architectural projects possesses many hidden dimensions. These hidden dimensions are usually not covered within the realm of course contents (Dutton, 1991) | Precise definition of the ontological dimension of how architecture is defined and of the epistemological dimension of how knowledge about architecture is construed (Yanar, 2007)  
The ground breaking designs are those which possess innovative and creative qualities; that is, design that changes the design variables in such a way that the results are solutions that were previously unknown (innovative design) or design that introduces new variables and that subsequently produces entirely new products (creative design) (Gero & Maher, 1993) |
| b. The style of communication and communicators' qualities | Design tutors have a lack of: a. understanding of the pedagogical dimensions of creativity in architecture and design; b. appropriate strategies to understand where different levels of creativity occur and how they should be assessed; and c. appropriate models or tools to support the assessment of the creative component of design (Ostwald & Williams, 2008a; 2008b) | Cultural communication secures the exchange of experiences, the learning outcome and the creativity (Ekstedt, Lundin, Soderholm, & Wirdenius, 1999)  
Social communication is meant to balance stability and change in order to promote dynamism and creativity (Johannessen et al., 2011) |
| b.1. Tutors' qualities | Design instructors are not clear about their studio goals or objectives and will change them from the start of the project and during the assessment process (Seidel, 1994)  
Instructors tend to consider teaching practice to be an intuitive process based on subjective view points and personal feelings (Salama, 1995)  
The teaching and judgement of design creativity inevitably rely on the instructor's subjective understanding of creativity thus students may find themselves confused as to the requirements of their creative tasks (Williams et al., 2010)  
Over-defined learning and assessment outcomes stifle the students' opportunities to be creative and teachers fail to recognise their creative efforts (Ostwald & Williams, 2008a) | The teacher must encourage students to integrate production with perception and reflection, to engage in self-assessment and to be open to feedback from teachers and peers (Williams et al., 2010)  
The tutor must be sensitive to students' signals of creative behaviour, such as being adventurous and willing to take risk (Lindström, 2006) |
| b.2. Design students' qualities | Students are passive learners (Salama, 2009)  
The design studio assumes the mastery of the instructor thus the student has to believe in the power of the instructor (Salama, 2005; Schon 1980s) | Following the design approach style of design experts would initiate creativity (Lawson, 2003)  
Designers should explore unfamiliar and unconventional design solutions and they should perceive the design problem from unorthodox and innovative perspectives (Casakin, 2007)  
Designers should inspect the underlying pattern and made connections in a design situation (between design aspects) and also make a connection with some precedent in the episodic memory (Lawson, 2003)  
Designers should simultaneously learn about the nature of the problem and the range of the possible solutions (Lawson, 2006) |

(Continued).
In her model, Amabile (1998) has identified five environmental components that affect creativity:

- Encouragement of creativity: which encompasses open information flow and support for new ideas at all levels of the organisation, from top management, through immediate supervisors, to work groups.
- Autonomy or freedom: autonomy in the day-to-day conduct of work; a sense of individual ownership of, and control over, work.
- Resources: the materials, information and general resources available for work.
- Pressures: including both positive challenge and negative workload pressure; and
- Organisational impediments to creativity (including conservatism and internal strife).

Sternberg and Lubart (1991) observe that in order for creativity to exist, the environment needs to be supportive and rewarding of creative endeavours. This is essential for knowledge development which is, in turn, important in initiating creativity (Hamel, 2006).

The design studio’s environment is a unique environment and it is the core of architectural education. The social scope of a design studio most often dictates on the students’ systems of values, norms and patterns of behaviour as prospective professionals (Yanar, 2007) The design studio provides students with a new awareness of the social mechanisms of the profession which traditionally are being ‘assimilated’ by the students. This awareness makes them able to take a critical stance on the matter (ibid.).

To initiate creativity in the design studio, the traditional design studio should be modified so as to foster democratic participation and democratic communication between the participating students and instructors (Austerlitz & Sachs, 2006). Open communication in the studio is seen as the key to incorporating important values such as collaboration, community and respect for the everyday environment into the studio’s hidden curriculum (ibid.). The tutor should show appreciation and approval of the students’ courage. Moreover, the teacher must encourage students to integrate production with perception and reflection, to engage in self-assessment and to be open to feedback from teachers and peers (Williams, Ostwald, & Haugen, 2010). The tutor, as Lindström (2006) argues, must be sensitive to students’ signals of creative behaviour, such as being adventurous and willing to take risk. The design studio, however, assumes the mastery of the instructor and the student has to believe in the power of the instructor (Salama, 2005). The question is why they should so

### Table 2. (Continued).  

| Design studio’s criteria | Existing hindrances | Potential initiators |
|--------------------------|---------------------|----------------------|
| c. Design studio’s culture | Teachers may tend to be autocratic, repressive, and do little to encourage individuality and creativity (Davis, Kogan, & Soliman, 1999) | The creative climate should be an open, participative culture, having an idea-handling system, experiment-encouragement, and be a forgiving culture, having patience with failure, trust, conflict-handling through debate, and enable networking and sharing systems (Ekvall, 1991) |
| | Current studio culture rewards students with the best-looking projects (AIAS, 2003) | Five environmental components that affect creativity should be considered and these are: encouragement of creativity, autonomy or freedom, resources, pressures, and organisational impediments to creativity (Amabile, 1998) |
believe in design instructors who are, as Seidel (1994) highlighted, not clear about their studio goals or objectives and would change them from the start of the project and throughout the assessment process. Furthermore, tutors tend to consider teaching practice to be an intuitive process based on subjective viewpoints and personal feelings (Salama, 1995). Salama (2008) also reported that teachers lack the support to implement new teaching methods in architectural education.

The teaching and judgement of design creativity inevitably rely on the instructor’s subjective understanding of creativity. This, in turn, may potentially diminish transparency and consistency in teaching and assessment practices, and students may find themselves confused as to the requirements of their creative tasks (Williams et al., 2010). Eventually, current studio culture rewards students with the best-looking projects (The American Institute of Architecture Students [AIAS], 2003).

A close examination of the reviewed literature, as illustrated in the previous sections and Table 2, from the creativity perspective showed that the aim of various architectural pedagogies and architectural programmes is to produce new design solutions but not necessarily creative solutions.

Also, there is no obvious and direct link between the sociocultural diversity in the design studio and creativity i.e. how the sociocultural diversity would affect creativity. Consequently, the literature did not state how to define the creativity scope for architectural projects, nor how to implement creativity dimensions into the architectural design curriculum and pedagogy. There is an emphasis on frequent and democratic social communications. Nevertheless, the literature did not specify how to communicate, from whom useful information can be obtained, rules of communications and how to filter, structure and utilise the outcome of the communications to enable the production of creative projects. The literature motivates students to explore design from unorthodox perspectives and the inspection of possible solutions. This would help to produce new design products but necessarily creative products. The previous research indicates clearly the design studio’s tools, mechanisms, systems and climate that would initiate creativity. However, these issues are not specified in the architectural curriculum thus would be considered as another hidden curriculum.

**The research methodology**

The literature review highlighted the degree of complexity of the creative design process, communications and characteristics of the design studio’s environment. It illustrated the importance of a number of possible factors, i.e. the social interaction and the style of design instruction on the exchange of knowledge and development of creative projects. Meanwhile, it revealed a number of potential research gaps that should be bridged to help developing better understanding of the relationship between creativity and architecture. This research explores one of these potential areas of research. It investigates the possible impact of social factors on creativity in the design studios of Years 3, 4 and 5, College of Architecture, UoD. Therefore, the objectives of the research were:

- to explore the social hindrances and initiators for creativity in the design studio;
- to find out communication routes and techniques that students use to obtain innovative ideas and feedback; and
- to make recommendations.
The field survey was carried out and the aim was to find out what were the significant factors, and how they are linked together and influenced creativity in the architectural design studio. This was achieved by testing the possible impact of a number of social factors on creativity in the design studios of the College of Architecture, University of Dammam.

First, the questionnaire survey was conducted to ascertain the level of general agreement of students on various topics. Thus the interviews were conducted to explore the hidden causes behind the issues under study, to validate the questionnaires results and to clarify ambiguous points. Mixed methods were used i.e. quantitative and qualitative research methods. This was in order to have the findings relate to each method and be used to complement one another, as well as enhance theoretical or substantive completeness (Ausubel, 1968; Morse, 1991). One hundred and ninety-four male third to fifth year students, from the Architecture and Building Technology Departments were handed a questionnaire form. The first two academic years were excluded as they provide basic design architectural education. Participants were asked about the tools, systems and conditions that would help in producing innovative design projects. Forty-eight students replied. This constituted 25% of the total number of third to fifth year students. Two software programs were used to analyse the quantitative data: SPSS 16 and AMOS. The following statistical tools were used to analyse the data: mean calculation, percentage and path coefficient. Only the fifth year students, who participated in the questionnaire survey, were then invited for a subsequent interview. The reason for choosing solely fifth year students was because they were more experienced with regard to the social interaction problems of the design studio. Nine students accepted the invitation, and were interviewed using unstructured interviews. This type of interviews was used because it provides a relaxed environment which would aid the researcher in obtaining valuable information from the interviewees.

The field survey results

The questionnaire survey results

Respondents considered the following information resources as the most useful resources that help in producing innovative projects and these are ranked according to their usefulness (from more to less useful):

- communications with their colleagues from the same year;
- projects of higher year students;
- instructor's feedback and advice;
- communications with their colleagues from a higher year.

The most frequent activities and communications of students that happen in the design studio during the term time are the following (ranked from more frequent to less frequent at scale [1] Never to [5] Very frequently):

- the generation of many sketches before making up one's mind while working on a design problem;
- having interactive and useful dialogue with tutors on how to reach to a creative design solution;
- capturing innovative ideas of colleagues of a higher academic level from other departments; and
Table 3. The frequency of activities and communications that happen in the design studio during the term time (scale: 0 does not happen, 4 always happens).

| Design studio's criteria | Type of communications and activities within the design studio | Mean value |
|--------------------------|---------------------------------------------------------------|------------|
| a. The design studio’s pedagogy and approach to design | My tutors encourage me to make many trails to develop the design solution | 3.29 |
| a. | My tutors encourage me to follow various approaches to reach an innovative solution | 3.16 |
| b. The communications style and communicators qualities | I am praised and rewarded when I present a creative design solution | 3.10 |
| b.1. Tutors’ qualities | My tutors work on developing my innovative ideas | 3.04 |
| b.1 | My tutors give me the complete freedom to do creative design | 3 |
| b.1 | Strategies to motivate and initiate creativity are applied in the design studio | 2.89 |
| b.1 | The tutors successfully handle conflict through constructive dialogue | 2.87 |
| b.2. Design students’ qualities | The generation of many sketches before making up one’s mind while working on a design problem | 3.64 |
| b.2 | Having interactive and useful dialogue with tutors on how to reach to a creative design solution | 3.63 |
| b.2 | Capturing innovative ideas of colleagues of a higher academic level from other departments | 3.21 |
| b.2 | Not taking many risks because of the fear of failure | 3.14 |
| b.2 | Seeking students and staff from different departments to help in solving specific design problems | 2.97 |
| b.2 | Capturing innovative ideas of the same academic year colleagues from different departments | 2.91 |
| b.2 | Capturing innovative ideas from other departments’ tutors. | 2.87 |
| c. Design studio culture | The tutor’s ideas have the greatest weight in the design process | 3.5 |
| c. | We always use and integrate different tools to initiate creativity and creativity (e.g. brainstorming, group work, etc.) | 2.77 |
| c. | The design studio environment is governed with an open, participative culture | 2.6 |
| c. | The design studio environment is governed with a forgiving culture, patient with failure and trustful | 2.6 |

- not taking many risks because of the fear of failure.

Whereas the least frequent activities and communications of students are:

- seeking students and staff from different departments to help in solving specific design problems;
- capturing innovative ideas of the same academic year colleagues from different departments; and
- capturing innovative ideas from other departments’ tutors.

It seems that the design studio is governed mainly by two types of activities/behaviours (see Table 3). One of these seems positive, which is the student’s frequent use and integration of different communications activities and techniques to initiate creativity, and the other seems negative, which is the tutor dominance on the design process. Students said that tutors mostly encourage them to: make many trails to develop the design solution, follow various design approaches to reach an innovative solution and present a creative design solution. However, around one-third of students said that strategies to motivate and initiate
creativity are rarely applied in the design studio and conflicts are rarely handled through constructive dialogue.

The most frequent support that students get from the tutors concerns the following cumbersome situations (arranged from more to less): the attempt to change the whole design solution during the design process, confusion over the nature and context of the design process, the attempt to change the approach to a design solution during the design process and misunderstanding of some project requirements. The least frequent support that students get from the tutors concerns the following cumbersome situations: little knowledge of students regarding one of the design aspects and misapplication of one of the design requirements.

The coefficient path results

Only coefficient path relations that have significance value (i.e. < 0.05) are reported here. The coefficient path results show that when the frequency of tutor’s support regarding some cumbersome design situations of the tutor increases, the student’s performance (represented by the final grade) of the student improves. The results show that when the instructors encourage the student to follow various approaches to reach to an innovative solution more frequently, the student would be more able to proceed from one design stage to another smoothly and to make radical changes to the design solution. Also, when students engage in more interactive dialogue with their instructors on how to reach to a creative design solution and attempt – more frequently to capture innovative ideas from colleagues in the same and higher academic level, they would be more able to: quickly understand the design problem, do quick analysis of the design problem, set a quick conceptual design solution and carry out a fast appraisal of a design solution and their grades. Students who seek students’ and staff’s help, and capture innovative ideas of colleagues of the same academic level from different departments more frequently, would be more able to make radical changes to a design solution. Eventually, when the design studio environment is governed with a forgiving culture, is patient with failure and is trustful more frequently, the student would be more able to do quick analysis of the design problem, fast appraisal of a design solution and proceed from one design stage to another design stage smoothly. On the other hand, the coefficient path results revealed some odd results. For example, more frequent support from the tutor regarding the student’s uncertainty about a design aspect and misapplication of a design concept affect negatively the student’s ability to do a fast appraisal of a design solution thus lowering his design grades. Further investigation was undertaken to clarify the questionnaire results.

The interview results

The interviews showed that factors that affect social interaction and thus creativity in the design studio are:

A. The design studio pedagogy and approach to design
Student stated that the guidance at the start of the project development is very important. A student said that intensive guidance is mostly needed at the initial stages of design. However, the guidance is sometimes not clear as some design parameters are missing. This is because of some tutors who do not explain it in the right way, or they do not even mention
it. Some tutors guide their students to a certain way of developing the design scheme, but they describe it in such a way that students do not get the message and do not know what their tutors aim to reach. During the design negotiations, some tutors do not clarify what is the nature of the design problem, and where to start to sort it out. They ask students to explore various approaches without giving sufficient guidance of where and what to explore. The student continues: ‘The problem is that the tutor would ask us to change the design concept without giving a convincing reason or point out exactly where the problem exists’. Some tutors give unclear critiques of the design scheme and demand radical changes. One student says:

Tutors might say ‘Develop any design scheme and we will help you to develop it further.’ At the end, you discover that you return to square one as you bring a complicated design scheme that they cannot comprehend and this gives them an opportunity to reject it or to heavily criticise it.

During the design process, tutors sometimes provide support at an inappropriate time i.e. too late or too early, thus it affects the project’s quality, the student’s psychological condition and his final grade. Another student mentioned that the tutor should start from what the student has already designed and he should not impose his own ideas. Tutors should show some design precedents to students and explain about various negative and positive aspects of the project’s design. Thus students would have background on how professional architects deal with each design problem and how they sort it out. Tutors should develop awareness of the student’s abilities (i.e. weakness and strengths) and thus provide support that is tailored to each student’s ability. They should motivate and encourage students and this can be in the form of praise, bonuses and incentives.

B. The style of communication and communicators’ qualities

B.1. Tutors’ qualities. Students complained about the following aspects that are related to the teaching methodology and tutors’ behaviour. The study found the following issues that are related to tutors:

(I) The tutor’s performance and way of communication with students: A student said that the atmosphere of the design studio is friendly – in general – but some tutors occasionally intimidate students. This would badly affect the student’s attitude and quality of work. In some instances, some tutors do not like the initial design concept and they accuse the student of not wanting to learn. The style of instruction is sometimes humiliating and aggressive, as some tutors make fun of the student. With regard to communication, some tutors are less able and slower to communicate with students. The matter is not about the frequency of communication but about communicating ideas, and one student claimed that the tutor’s imagination of the design outcome differs from that of the student. So one may reach the end of the semester and the tutor would say suddenly to him that he has a bad design scheme. One student said that a tutor may suggest an idea to the student, who is unable to develop it. The student may misinterpret the tutor’s suggestion and thus apply it wrongly.

(II) Level of flexibility of the tutor’s thinking: Some tutors do not have flexibility of thinking. It is hard to convince them of a design solution as they see that it does not comply with their thinking and approach to sort out the problem. Thus they are unwilling to help the student. They would rather ask the student to change the design scheme to something that they are willing to negotiate. Some tutors are also unable to discover the innovative aspects in the student’s design. They insist on
their own ideas and, when a student represents his ideas to them, they hesitate to accept them. The interviews revealed that students follow their tutor’s opinion not because it is convincing and rational but as the tutor provides a substantial input into the total grade.

(III) The tutor’s commitment and knowledge: Some tutors are committed and helpful whereas others are not. There is support during the start and the end of the project but it is unstable and changeable in the middle of the project. With regard to the level of design knowledge, some tutors do not know, for example, how to apply sustainability in a practical way in the design scheme.

B.2. Design students’ qualities. One student mentioned that the design process requires extensive knowledge of certain types of design information and if the student does not have this knowledge, he cannot produce a good design scheme. Another student said that some students do not like to radically change the design concept unless the tutor asks them to do so. On the other hand, some students have low design abilities; they are stubborn and unwilling to change the design scheme even if the tutor has asked them to do so. The tutor would spend considerable time and effort with these students without any progress, and thus became depressed and started trying to force the student to follow a certain design scheme. On the other hand, some students do not trust the design abilities of their tutors! One student said: ‘I take the alterations to my design scheme that are suggested by one tutor to another so I would find out what is the opinion of the other tutor about these alterations, thus try to co-ordinate between their opinions.’ Some students – even in the final year – have a communication problem with the tutors. They do not know how to communicate with them and how to discuss design issues with them.

C. Design studio culture
The design studio environment has its problems and students claim:

(I) The lack of democracy at the design studio and college level: Students do not feel that they are an integral part of the college as they are not allowed to participate in the college’s decision-making. This reflects badly on the student’s psychological state and his relationship with the college’s staff. The students claimed that the design studio is governed and restricted with unwritten conditions and laws that hinder creativity. One student said that he feels that the college is segregated. He continued: ‘We do not know what each tutor teaches. Also we do not know which department other students belong to, and their academic strength areas that we can utilise.’

(II) Lack of support from colleagues, other departments’ tutors and students: The communication and discussions within the design studio help in developing the design scheme. Some students stay and work at the College even during the night. There are daily communications. A fifth year student said: When I do a design scheme, I show it to another colleague who gives me his feedback. This also happens to me as students from second and third years come to me and get advice. Even if the student did not follow what has been discussed, he would utilise the methodology and the way of thinking and how to make judgments etc.” The communications with other tutors and students are good, as a student commented: ‘The higher year students would give you advice and show you another approach or easier way to
sort out design problems’. However, there are weak and infrequent communications with other departments’ tutors and students.

Discussion

This study – supported by the previous research – shows that the social settings of the design studio play an important role in the life of architectural students and influence their creativity. Unfortunately, the study found few positive factors. It revealed that students usually seek advice and they benefit from the communications with their tutors, other design studio tutors and higher year students as they learn new ways of thinking, approaches to the design and sorting out design problems. On the other hand, the field survey, supported by the research findings found by researchers from various schools of architecture, has shown two main problematic areas that explain why the interaction between the student and tutor is not functioning and design negotiations do not reach a fruitful creative result, despite the frequent communications between them. This would affect negatively the student’s ability to produce creative design products. These areas are:

A. The design studio’s pedagogy and approach to design

Students stated that design precedents are essential but they are useless if the tutor did not explain how to analyse their negative/positive features and innovative aspects. The design approach’s style is affected by some tutors: (a) failure to provide adequate support, whether in the type of support, the timing or the clarity; (b) Shortcomings in performance and clear ways of instruction about the design of the project; (c) insufficient commitment and knowledge; and (d) lack of flexible thinking and understanding of creativity. In addition, some design parameters are explained in a vague way, being forgotten or neglected.

B. The style of communication and communicators’ qualities

B.1. Tutors’ qualities

- Tutors have their own views about the importance of various aspects of creativity and these are different from the students’ views
- Some tutors have misunderstanding/misinterpretation of complicated design schemes that are done by students
- Support is not provided to students at the right time, thus it was considered to be useless
- Some tutors do not have the capability to perceive the creative design abilities of students i.e. the weaknesses and strength. Thus they are incapable of providing support that is tailored to students’ abilities
- Some tutors seem to humiliate students
- Some tutors insist on their own design ideas so they are unwilling or hesitant to appreciate/accept the students’ ideas; and
- No strategies were set for applying the creativity dimensions in the design project.
B.2. Design students’ qualities

- Students have little knowledge of how to design some architectural aspects of a project
- Some students are unwilling to collaborate with their tutors and have little trust in the tutor’s design abilities
- Some students have communication problems with their tutors as they do not know how to communicate with them
- During development of the design scheme, it appears that each party, i.e. the tutor and the student, has a different imagination/idea of what the final/possible design solution/outcome would be; and
- Students communicate frequently with their design instructors and with colleagues of the same department whereas some of them communicate infrequently with the tutors and students from other departments.

C. Design studio’s culture

The study found a number of negative design studio culture aspects. The design studio environment suffers from: (a) the dominance of the tutor’s opinion and design approach’s style; (b) autocracy at the design studio and College levels; (c) lack of support from, and communication with, other departments’ tutors and students; (d) the student’s poor levels of trust in the tutor’s design ability; and (e) some intimidating practices.

Conclusion

Creativity should be the aim of any design studio. Therefore, major transformation should be undertaken to the design studio to improve the design studio environment and help students to produce creative projects. To do so, the study suggests corrective measures that should be carried out on the following fronts:

A. The design studio’s pedagogy and approach to design

Clear course’s instructions and objectives should be set at the start of the course. Communication rules, and design tools and mechanisms should be defined to avoid hidden agendas as far as possible. Tutors should first develop deeper understanding of creativity in architecture and design and how to assess it. They should define the creativity criteria for the given project and how these should be applied. This can be done by linking each of the design course’s objectives to one or more of the creativity dimensions as determined by tutors. Also, they should set a clear roadmap of how to apply these in the design project, thus discussing with students to reach to common understanding and application of the creativity dimensions in the design project. Shared understanding with the jurors regarding the application of creativity into various aspects of the project is also required so the assessment of the project would be consistent with the design course’s objectives.

Students should be taught how to look for innovative architecture solutions, explore the innovative aspects of each case study and experiment with possible links between innovative design aspects/solutions and each dimension of the design problem, just as expert designers
usually do, as well as experimenting with possible links with the ideas that they obtained from the design negotiations.

Innovative design precedents are important and should be made available to students as this would remind students of possible design solutions. These include case studies that have potential partial or complete creative design solutions for architectural, technical and structural aspects of building design. However, students should be taught how to analyse innovative features of these case studies and how to link these with various aspects of the design problem as applicable.

However, this would not be successful without making transformations to the architectural curriculum. Creativity should be the aim of the curriculum, and a clear definition of the creativity scope should be set thus the objectives of architectural curriculum should be revised accordingly.

B. The style of communications and the communicators’ qualities

B.1. Design instructors’ qualities
Tutors should be sensitive to the needs signalled by students so they provide them with support at the right time; meanwhile, students should be encouraged to communicate frequently with their tutors and other students and explore the potentiality of various design solutions. However, frequent communications and learning from experts would not achieve their objectives without providing solid foundations and changing the way of teaching instruction and methodology as suggested above.

Tutors should not impose their own ideas on students but introduce to students and encourage students to explore how this can be integrated with the students’ design ideas. Training courses for tutors and students regarding the improvement of communication and interactive skills and how to perceive students’ creative abilities and needs are required.

B.2. Design students’ qualities
Students should communicate design ideas frequently to their design studio colleagues, tutors and students from higher years as this would significantly improve their design abilities. Students should be open minded and think ‘outside of the box, have a flexible attitude and negotiate design ideas. This would help them as the expert designers to find new design variables that subsequently may produce creative products. Keeping a record of the design negotiations would be useful as it may help the student to track the progress of the design and explore new links between design negotiations at various stages of design and the design problem.

C. Design studio culture
The college should set and apply professional conduct mechanisms that regulate the relationship between the tutor and student and provide the democratic environment that is necessary for initiating creativity.

Future research should explore how the sociocultural diversity would affect creativity as this has been covered in this research.
It should also explore how to implement the creativity dimensions in design projects at different levels of architectural education, and how to devise the design process/decision-making process to initiate creativity.

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