Architectural Learning Tool

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For:

My Parent

And

My Family

For Their Patient and Sacrifices

Abstract

Current trends in architectural education lean toward presenting and discussing the end product more than the process that leads to it. They equally highlight students' passive participation at the design studio practice. In response, this research aims to develop a design-learning tool that should overcome these dilemmas and others, and develop a design practice that enables and encourages students to share the responsibility of developing their design practice with the design tutor. This tool is called the Architectural Learning Tool or ALT. ALT has therefore four objectives to achieve:

1- Improving students' design practice;
2- Increasing students' participation in the design studio;
3- Exposing students to other designers' experiences;
4- Increasing the students' understanding of the design practice.

The theoretical grounding of the ALT is mainly Kolb's and Schon's theories. The Experiential Learning Theory by David Kolb aims to activate learners' participation at the learning environment through the use of their prior experiences at the new learning activity. The Reflective Practice Theory, by Donald Schon, provides a paradigm for describing design action that deconstructs the design process into four actions, naming, framing, moving, and reflecting. Therefore, it could be utilised by students in the design studio to explicit the design practice, present and discuss it in meaningful manner. These theories have given this research the theoretical framework to create the ALT, and develop it as design teaching technique.

Based on these theories and the extensive review of the architectural education literature, researcher has developed a ALT teaching model for students to practise design in the new environment, and according to the required studio setting. This design-teaching model consists of four parts:

1- Designing according to the students' existing design mode;
2- Deconstructing the design practice according to Schon's framework;
3- Replicating the design practice of other students;
4- Re-Designing the project in the manner of other designers.

The research data consists of recorded students presentation and discussion sessions, and in-depth interviews with students, as group and individuals, after they have completed the ALT's project. All of these data are analysed to clarify the achievements of the ALT and its role in developing students' design practice.

The research results indicates that the student design practice has been improved in three domains:

1- Enhancing the designing activity by providing students with different design techniques to practise design professionally.
2- Assessing students' design practice to determine the strong and weak sides.
3- Enhancing students' ability to communicate meaningfully with others during the presentation and the discussion activities of the design practice.

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Introduction

1. Background

Since my undergraduate studies, which was followed by several years of professional practice the question "**How do designers acquire and develop their design skills?**" has dominated my thinking. This preoccupation has led to my involvement in many design practice activities with other architects in order to find some answers to this complex question. After several years of practice, I ended up with the decision to investigate this issue through the academic set up, and to try and find the answer at a higher level in and through the graduate programme. My choice of the professional graduate studies at the University of Washington in St. Louis USA, aimed to discuss and investigate this issue with others in academic environment. During the two years of the Master's degree in that school, I concentrated on the courses that could bring me closer to the real practitioners who work within the academic boundary. As a result I was able to investigate the argument in more detail. That led me to identify different aspects related to the question, such as design theory and design education and, in addition, to investigate the design process discipline for an explanation of how design practice takes place, and what the designer actually experiences during these activities.

All of these years of activities led me to decide that the best way to investigate this issue is to conduct a more theoretical and organized research work at a post-graduate level under the supervision of the author of the first book I read during that stay in St. Louis, **How Designers Think?** by Prof. Bryan Lawson. The research activities for the PhD, under Bryan, spanned over three years, and covered a wide range of aspects related to the (research) prime question.

After this long journey and after conducting different research activities to investigate the research prime question, I became more and more convinced that to help practitioners to develop their design practice and to allow them to be better designers, we have to go back to the educational system that produces such practitioners and begin the modification at that stage.

Therefore, the research prime question has become: "How students could develop their design practice?". Investigating the nature of the design practice and the development properties of this action, within the educational context, reveals that there are different constraints that prevent students from taking the

lead in developing their design practice and in having significant role in the activities of acquiring the provided knowledge and developing the design skills. These constraints are a result of different dilemmas in architectural education, and this research concentrates on three only.

The first dilemma that contributes to the existence of this situation is; I found during my school years and the years of the professional practice that designers in practice and students in schools of architecture do not have a clear description of how to develop design practice and the design skill. Usually the normal answer for such question is: "just do design and discuss the end product with others in order to develop the design skill and the design practice". Such answer is emphasising that students in schools have to dig at the same hole forever, until something happens. My answer for this question is: there could be better ways we could approach the domain of developing design practice, and one should try to look at this practice in more detail to understand its components and monitor how students actually practice design in design studio.

The second dilemma, after directing research from professional to education domain, I found is that, in general, students in the design studio are considered by design tutor as receiving knowledge and users of the provided skills, and they do not have active role in the studio practice, in which design tutor is fully responsible for providing everything in the studio, from choosing the studio project, to defining its objectives, the educational objectives, and what it could provide students with; in addition to the type of materials students could use and consult. In general, students are not controlling any valuable aspects in the studio practice. The design tutors directs them toward what they think are the best for them. So, students design practice could improve and develop according to the design tutor's interest, and students do not have any significant role in developing their design practice.

The last dilemma is that the current architectural education and design studio practice are built upon the idea of performing and presenting the end product. The main aims of the traditional assessment means, the design crit, is designed to allow students to present their design works as end product in the most attractive way to catch the eye of the juries, and to encourage students on how they could perform in the crit.

In reality, the crit, or jury, is not presenting the complete picture of what students learn and acquire from the past project, because the crit is made to present the end product, and the juries are interested more in the quality of the product than the way this product was produced. This concentration on product is actually reflects the reality of the professional practice; in which client is not interested on how the building was produced but how such building could fulfil his/her needs and accommodate the requirements. But in the educational setting, we do not think the case should be like that. In a school of architecture we aim to educate students how to be "good architects", and to prepare them for the real professional practice; so, they have to learn how to practice design more than how to present the product, and develop their design practice in order to produce successful buildings

In conclusion, the main aspects that prevented students from developing their design practice in the design studio are as follows:

1. For students to learn how to design and develop their design practice, they have to conduct design, and present it to others.
2. Students in design studio are passive participants in this environment, and the development of their design practice is under the control of the design tutor.
3. Architectural education is mimicking the real professional practice, and does not consider the reality of the educational setting.

Therefore, the domain of research becomes more educational than professional. As a result of that, we identify different aspects that have to be involved for the research theme to be understood and these dilemmas solved. One of these aspects is learning from experience, in which the modern learning theories emphasize the significant role of prior experiences in developing learners' skills and in improving their behaviour in the new learning situation. Therefore, the research theme has been modified to investigate the original theme and respond to the current needs of the modern learning theories. These needs have some implications for architectural education. Therefore, integrating all of them with the research theme led to reformulating of the research prime question. So, the prime research question has been modified to be:

"How students could develop their design practice, and learn from their prior design experiences."

2. Research Aims

After identifying the main problems in the current educational system, which prevented students from taking the lead in controlling their design practice and improving its condition; and after modifying the research question, this research aims to develop a design learning tool that enables students to control the development of their skills, and to share the responsibility with their design tutor(s). This tool is called "Architectural Learning Tool (ALT)".

3. Research Hypothesis

For the research aims to be achieved, and the problems of the current architectural education to be solved, different aspects have to be accomplished.

1- Create learning environment in the design studio

As the design studio is the environment in which students practice design action and acquire the knowledge and the skills they may need for this practice, we as educators, have to create the appropriate environment in which students could take the lead in controlling and developing their design practice, and share the responsibility with the design tutors. The two players in the design studio, student and tutor, could help in creating the learning environment by considering the following aspects:

A- For design tutor:

The design tutor has to accept the reality that in order for students to be active and participate in the process of developing their own design practice, he/she has to reconsider students' role in the design studio, and respect their contributions in order to improve them to the level of the contributions of others, such as practitioners. If design tutors do so, they could enhance the studio environment, and help students to raise the value of their contributions.

B- For students:

Students could create a position for their new role in the design studio practice by having the confidence in themselves, and considering themselves as active participants who have responsibilities in the studio, not only to acquire the provided knowledge and skills, but also to contribute actively in the design studio practice.

2. Developing a design teaching model

In order to realise the ALT, and for design tutor and students to play their suggested roles, we have to create the environment for this new role. Developing a design-teaching model could create the environment. In this model, design tutor could guide students through the sequences of the ALT, and practice various techniques to improve students' design practice. ALT teaching model could be a unique one, or adaptation of an existing teaching model. As any other teaching model, the ALT teaching model could consist of stages, with each one aiming to accomplish a specific aspect in creating the ALT.

3. Re-designing the design crit

The current situation of the design crit, as a means of assessment, or marking, has to be modified and changed to be a learning means in which students are presenting not only their end products, but also the design process; and the juries are concentrating on how students generated their ideas and developed them into a building form. Therefore, design crit, as studio activity, could be converted into a learning experience in which student present his/her design product as a sequence of actions, and the juries direct their comments and feedback toward these stages. As a result, students could learn from their presentation and discussion activities.

For these aspects, studio environment, design teaching model, and re-designing the design crit, to be effective and have implications on students' design practice, it is suggested that students' prior design experiences have to be the medium for application. The medium for conducting and applying the ALT has to be on students' completed project which has to be the means for discussion and presentation.

The importance of involving students' prior design practice lies in the following:

1- Students could increase their participation.
2- Design tutor could realise the nature of student's active participation, and could increase the value of that participation.
3- Students could interact with each other to clarify the unclear aspect because both designer and listener are students; so, the presenter could defend his/her work if it misunderstood or misinterpreted.

In general, utilising student's prior experiences in design studio practice could allow students to assess their design practice and identify the strong and weak features in it. Acquiring the means for assessing students design practice is the first step toward developing that design practice. In addition to that, design tutor could determine what students actually learn in the past design exercise, and bridge the gap between different design studio projects.

4. Research objectives

The research aims to develop a design learning tool that aims to develop students design practice and improve their sequences of learning from their prior design experiences. To accomplish this goal, the research has determined four main objectives for the ALT to achieve:

1- Improving students' design practice;
2- Increasing students' participation in the design studio;
3- Exposing students to other designers' experiences;
4- Increasing the students' understanding of the design practice.

While the first objective is the main one, the importance of expanding this objective to include different ones is to direct research attention toward other aspects that could have a potential role in developing students' design practice, and widening our vision about the nature of the design practice.
In addition, the second objective is a reflection of the student's new role in the design studio, while the third one is considered as a means for encouraging students to be active in any design action, even though, their work is not utilised. The last objective is important because most students still believe that the main

chunk of the design process is a cognitive activity that nobody could accesses, but in reality, there are different aspects in the design process we could share with others, and explicit for others which could help to improve, not only the product, but also the process.

To fulfil each one of these objectives, we have to investigate different aspects which could determine the scope of the literature review, and which disciplines have to be included to build the theoretical base of this research. This issue is investigated in the following section that analyses the research prime question.

5. Research Prime Question

There are different sub-questions that could be extracted from the final format of the research prime question, "How students could develop their design practice, and learn from their prior design experiences." The idea of extracting these sub questions from the main one is to determine the parameters of the research literature review, and some constraints in designing the research experiment.

1. Can design practice be developed?

This question is examining the possibilities of developing design practice as a practical skill, and whether this skill differs from other types of practical skills that could be developed by doing.

2. How can design practice be developed?

With this question, the inquiry is expanded to cover the potential aspects that have to be included for the design practice to be improved. These aspects could include:

a) How to communicate with others during the process of presenting and discussing
b) How to assess the design practice
c) How to conduct design action

Therefore, the argument could become: Do these aspects have a role in developing design practice?

3. Do students have a role in developing their skills?

This question inquires about the potential role of students in controlling and managing the activities of developing their skills.

4. *Does the design studio practice and set-up have a role in the process of developing design practice? And, if so what should the studio setting be?*

In this question, the argument of the affect of learning setting and how we could practice design in the design studio is challenged. The argument is extended to investigate whether there is any specific setting the design studio has to follow, and implement.

5. *Does learning from experience have implications on developing design practice?*

This question challenges the proposition of learning from experiences, and whether the prior experiences could have an input in the development process of the design practice. In addition to that, do students benefit from involving their experiences? And does such involvement adapt their behaviour in future activities?

6. *What is the potential role of the prior design experiences in developing students' design practice?*

In the last sub-question, the inquiry was directed specifically to the students' prior design experiences, and whether these have any additional role in the development processes.

6. Thesis Structure

This thesis, which documents the whole story of the research journey, is organized according to the research sequences which start with the theory that sets up the research parameters and builds the argument, followed by the researcher's proposition, in which research tool is explained, based on the preceding chapter. Then, the research method is presented that determines the means of testing the research hypothesis, followed by the design experiment; in which eight undergraduate students utilised the research tool in a real design studio. Afterwards, the experiment's results and discussions are presented and

analysed. Finally, the conclusions of the research are presented to end this journey. These aspects make up the six chapters of the thesis which is preceded by the abstract followed by the introduction. Ultimately the thesis ends up with the bibliography, and the appendices contained samples of the interviews, the questionnaire, and the publications.

Chapter One, the theory, aims to investigate different aspects related to the research domain and the prime question. As the research sub-questions determined the parameters of the literature review, this chapter consists of six sections in which each one is devoted to a specific subject. The sequencing of these sections begins with the more general subject related to the research and narrows down to the more specific one. The first section, titled "learning and teaching", aims to investigate the nature of these two distinctive activities, and the environment of each one, and in addition to that, the role of students and teacher in enhancing the students' active participation. This active participation and how it could be enhanced is the theme of the following section, which is entitled "learning from experience". As this researcher argues that involving students' prior design experiences is the means for activating students' participation, this aspect is studied in great details in this section, and the one that follows. In the second section, the experiential learning theory, and its different generations, is studied, as well as how students could utilise their prior experiences in the new learning activities. As the reflection on experience is considered a means of relating new experience to the one that preceded it, the third section, "reflecting on experience", aims to investigate the nature of reflection action and its characteristics. As one can see, the first three sections are not related to architectural education or students' design practice; they are intended to explore the domain of education from a wider perspective; but the remaining sections in this chapter are directed toward the research domain. These sections commence with the fourth section, titled "design studies" and which aims to investigate the nature of the design action and different characteristics for this creative act. In addition, the two main paradigms for describing design action are presented, which lays the ground for the following section, section five, titled "professional knowledge". The professional knowledge is considered as the fuel of the design activity, in which its nature is

highlighted, in addition to the characters and components that are also presented. The last section, "architectural education", concludes this chapter and investigates the domain of architectural education from different perspectives. It includes different design teaching models and other techniques that have been specifically developed for architectural education and the design practice.

Chapter two acts as a transition between the theory and the results, in which the theoretical information are converted into a practical tool. This chapter is devoted to presenting and describing the ALT according to five themes. The first one presents the nature of the ALT according to the research objectives, and how this research could overcome the identified problems in the architectural education at the design studio. The second theme is about the process of creating ALT and realising it. The third theme is explaining the ALT design teaching model and how students utilise it in their design process. The fourth and the fifth themes concentrate on the experiment stages, either what we expect students to do during the experiment, or which type of data we could obtain from the research experiment. In general this chapter presents the researcher's proposition about the ALT.

Chapter three, the method, is devotes to the explanation of the nature of the research and the reason for considering it as qualitative research; and in addition, what we could benefit from this type of research method. The second section of this chapter aims to present the research data collection techniques that are made up of three types, direct observation of the subjects while they conduct the action, in-depth interviews with subjects, either in group or as individuals, and the last one is the questionnaire, an additional technique, to get subjects feedback about some specific aspects in the experiment.

Chapter four, the experiment, sets out to determine how research experiment is formulated, and explains its properties. This chapter starts by explaining the experiment setting, such as: subjects' profiles, studio setting, experiment project, time frame, and the experiment sequences. All of these aspects are explained in details before explaining the experiment itself, and how the ALT's design teaching model is formulated and developed. The experiment consists of three stages: designing stage, replicating stage, and re-designing stage. Each one is devoted to providing students with a specific skill and knowledge to conduct design according to the research objectives and aims.

The results and discussions are the theme of the **fifth chapter** in which research results are analysed and presented, followed by the discussion and the implications of these results. This chapter commences by the method of analysing the research data, and the sequences that have been followed to conduct the analysis activities. The second section is the presentation of the research results and findings. These findings are presented according to three domains that reflect the area of students design practice that have been developed and improved as a result of applying ALT. The first domain is the communication activity, in which ALT improves students' ability to represent their design work and discuss it with others. The second one is assessing students' design practice, in which the ALT provides students with the means to assess their design practice and to identify the strong and the weak features in their practice. The last domain presents additional means that ALT provides students with in order to improve their design practice, such as, the precedents as agent for inspiration of ideas. The last section is the discussion one, in which the implications of the research findings and results are presented. Besides developing students' design practice, ALT has implication on two additional domains within the environment of the design studio. The first one is the architectural education in the design studio, in which different aspects of this domain have been improved, such as the learning environment in the design studio, the design crit; in addition to introducing different new practice in the design studio, such as: the idea of student's precedents library, and the stage of self assessment in the design studio practice. The second domain is the student's professional practice, in which ALT provides students with skills to prepare them for the real professional practice. Therefore, means for group communications, the act of completing others' design works, and different practitioner skills that allow students to improve their design practice in professional manner.

This thesis concludes with **chapter six**, which presents the conclusion of the research, and in a form that, reflects the research results on the research prime and sub-prime questions. Also presented here are the future works that need to be done for the results to be implemented and for the ALT's shortcomings to be overcome.

Chapter One

Theory

1. Teaching and Learning

1.1 What is Teaching and Learning:

According to the teaching and learning literature there is a wide agreement between researchers in determining the definition of learning and teaching. Gary Fenstermacher (1986) argues that teaching is a relationship between two actors, the one who has the knowledge or the skill, and the one who tries to acquire such knowledge and skill. Therefore, the two players during any teaching practice are either:

- Teacher, as the provider (P); or
- Learner, as recipient (R).
- And the transferable material that the two deal with is the context (C), which consists of: information, skills, beliefs, emotion, understanding, …etc.

All of these elements make up C, and are owned by P, while R aims to acquire them. In other words, teaching activities are what the teacher tries to deliver and convey to the students.

So, if the provider delivers the context then the teaching activity is completed, but the learning activity, which reflects how the recipients receives the context and utilises it, is not guaranteed.

In addition to that, the author argued that learning is the representation of what the recipient acquires and obtains from the teaching activities. Therefore, we could guarantee the teaching outcome but not the learning one. So, the relationship between teaching and learning is not exactly that of cause and effect; but if learning occurs then that means the teaching is successfully completed, but not vice versa. So, to have successful learning we need more than successful teaching (Fenstermacher 1986).

In addition to that, Clayton (1965) holds a similar point view about the definition of learning. For him, teaching is "what teachers do". The teacher not only delivers and passes the materials, which consist of facts and ideas, but also organizes these materials and prepares them before conveying them to the students. In addition, teachers "have goals, worries, fears, frustrations, and satisfactions related to their job". All of these could describe the teaching act.

On the other hand, to learn, as Clayton argues, the learner has to be engaged in the experience and involved in the learning action. That is necessary for effective learning to take place and impact on the learner's behaviour. Learning refers to both process and product. For the process, learning refers to the experience the learner goes through, and how he/she interacts with that experience. As product, learning refers to the behaviour differences that occur in the learner.

For Paul Ramsdem (1992), who also has a similar view, the teaching activity is the teacher action, and learning is about students act. The teaching activities are constructed on how the teacher delivers the information and knowledge to the students, by which techniques and means. On the other hand, learning activities are constructed on the reaction of the students to the teacher. So, the student as recipient has to be active to acquire the proposed skills and knowledge, and his/her attention is directed toward the acquisition action.

For his part, Shull (1986) argues that the concern of learning focuses on how the learner acquires new knowledge and skills, and how the existing knowledge and skills are modified as a result of the introducing of the new knowledge. This argument stresses the means for acquiring the knowledge and how the modification of the learner's knowledge occurs. Therefore, the teacher has to concentrate on the two aspects: the means of acquisition, and the modification of the learner's knowledge structure in order to clarify whether learning takes place or not.

1.2 The Distinction between Teaching and Learning:

There are different viewpoints about this relationship. Some researchers argue that the distinction between learning and teaching is not clear (Nicol 2000), while others distinguish each one and claim that there is no relationship between the two (Prosser 1999). The last group argue that there is clear distinction between the two, but rather each one depends on the other (Fenstermacher 1984).

Nicol et al (2000) support the first argument and claim that the distinction between the two actions is not clear, and stress the role of the students during the learning activity. So, students have to learn how to learn, and control their own learning (Nicol 2000). On the other hand, the teacher has to contribute

unlimited efforts in order to create the appropriate environment to make learning possible.

Prosser et al (1999) present the second viewpoint and argue that the two activities, learning and teaching, are fundamentally related but each one represents a different action, and they could be described not as action but as experience. For the authors, the teacher does not experience the teaching act, but experiences teaching something, and the student does not experience the learning action, but experiences the learning of something.

Moreover, the authors argue that "good teaching" is about: setting the objectives of this action and how to achieve them, understanding how students perceive their activities, and how to get students involved in the teaching activity (Prosser 1999). So, good teaching is about thinking and developing ways of conveying materials to students, about how students receive what has been delivered and how to create the environment for such action to occur. Therefore, good teaching is about the means, student's mode (of learning), and the environment.

As for Fenstermacher (1984) who supports the last group, he distinguishes between the two actions in this way: learning can be conducted by one person, but teaching never less than two; also learning is also the action of acquiring something, while teaching is about providing or giving something. In conclusion, he claims "Wherever one looks, there is almost no parallel structure between the concepts of teaching and learning". In conclusion, this view stresses the fact that the learning activities can be done in an isolated setting, whereas teaching cannot be. Moreover, teaching is about giving something and learning is about acquiring. In general, according to the author, there is no connection between the two actions.

1.3 Student's and Teacher's responsibilities in the educational environment:

From the preceding sections we can identify the importance of active participation for teacher and students. Therefore, this section will highlight their responsibilities.

Nicol et al (2000) claim

> *For effective learning to occur, students have to interact actively with new information and new experience in order to own them and make them personally meaningful. They do this by actively constructing and reconstructing information input- by modifying, revising, and extending it, relating ideas to each other and to what they already know- in an effort to make personal sense of it. This constructivism view places the student at the centre of the learning relationship as far as knowledge and skill acquisition are concerned. Rather than try to do the job on behalf of the student, the teachers' task is to make learning (for understanding) possible, to facilitate learning. Their role is not just to impart the important facts and concepts in the discipline but also, more importantly, to help bridging the gap between the structure of the discipline and the structure of students' minds.* (p 14)

Therefore, Nicol et al argue that:

1- Students have great responsibility about their learning activities.
2- Teachers have to facilitate the learning environment for learning to occur.
3- Students have to interact with the information provided, and modify it to make it personally meaningful.
4- Learning activity has to affect students' behaviour, and to modify their existing knowledge structure.
5- Students have to learn how to learn.

In conclusion, the learning activity is a student action, and students could make learning possible if they become active, modify their learning environment, and construct and re-construct the learning information.

In addition to that, John Biggs (1999) claims that

> *Learning is . . . a way of interaction with the world. As we learn, our conception of phenomena is changed, and we see the world differently. The acquisition of information in itself does not bring such change, but the way we structure that information and think with it does.* (p. 13)

From this quotation, we can identify the important of learner's attitude during the teaching and learning activities. If the students interact as active participants, they will acquire the knowledge and modify the structure of pre-existing knowledge. But one has to understand that the change of the pre-existing knowledge, which has been modified, has occurred, not because of the

acquisition of the knowledge, but because of the interactive attitude of the learners during the teaching / learning activities.

As regards, the responsibilities of the learner in the educational environment, Fry et al (1999) argues that

> *Learning [is] about how we perceive and understand the world, about making meaning (Marton and Booth, 1997). It can be about abstract principles, factual information, the acquisition of methods, techniques and approaches, about ideas, behaviour appropriate to types of situations recognition, and finally, about reasoning.*(p 21)

On the other hand, Paul Ramsdem (1992) argues that while the teacher is totally responsible for the teaching activity, he/she is also responsible for creating the possible means of delivery and transmission of the material, for organizing the students' activities to guarantee the completion of the teaching activities, and making learning possible.

Sarah Dunham (1989) also claims that: "the function of teacher is to arrange- to design and implement- a context, in which learning can flourish." So, the teacher is responsible for creating the environment and developing the means for learning to take place and occur. Nicol et al (2000) too argues that the teacher is responsible for creating the appropriate environment for learning to occur, and help student to learn.

1.4 Research approaches to learning:

According to Thomas Shull (1986), there are two main approaches to learning research:

1. Cognitive Approach: This focuses on the acquisition of knowledge and knowledge structure. In other words, this approach focuses on the learner's change after acquiring the proposed knowledge and skills.
2. Behaviourist Approach: this approach focuses on "changing the environment in order to influence the learners, (Shull 1986).

So, each approach concentrates on different aspects and looks at learning / teaching action from different perspectives. The former focuses on the learner, the latter on the environment. Shull argues that cognitive approach sees learning as an active, constructive, and goal-oriented process that is dependent upon the mental activities of the learner (Shull 1986).

In addition to that, for cognitive psychologists learning is "cumulative in nature, nothing has meaning or learned in isolation" (Shull 1986).

1.5 Learning and teaching theories:

Building upon the former approaches, John Biggs (1999) states that theories of leaning which focus on how humans learn are based on two main theories:

- Phenomenology.
- Constructivism.

In addition, other researchers claim that there are three main theories, namely: Constructivism, Rationalism or (Idealism), and Associatism, (Fry 1999). Constructivism is considered as the most prominent theory according to Fry et al.

Going back to Biggs's argument and the two theories, Phenomenology represents the behaviour approach and concentrates on the learning environment

> *The essence of this view is that meaning is constituted through an internal relationship between the individual and the world. Learning is about experiencing the object of study in a different way, where the experience is a relationship between the person experiencing and the object experienced* (Prosser 1999: p 12-13).

The Constructivism theory represents the cognitive psychology, and concentrates on the idea that we learn by "continuous building and amending of previous structures', or schemata" (Fry 1999). In addition, the new knowledge and skills are integrated and adapted with the existing ones. So, this theory builds on the idea of building the learner's knowledge and experiences, and on improving/modifying their attitude. For any successful learning activity, the learner's attitude has to be modified and improved from one experience to another, and the learner's existing knowledge structure has to be modified and restructured. Therefore, unless the existing knowledge is improved or amended learning will not occur.

Fry et al (1999) argues that

> *Constructivism tells us that we learn by fitting new understanding and knowledge into, with, existing and supplanting, old understanding and knowledge . . .. Without changes or additions to*

> *pre-existing knowledge and understanding, no learning will have occurred* (p 23).

Therefore, the nature of the learning process, according to the constructivism theory, is about adding new knowledge to and amending the learner's pre-existing knowledge. This process of construction and reconstruction depends heavily on students' behaviour during the learning activities that, at the end, determine the possibility for learning to occur.

There is one condition for this modification and amendment to take place, that is, the new knowledge or understanding has to be more advanced than the existing one; but if it is not, then the modification will not happen, and in this case we can argue that learning has not occurred (Fry 1999).

1.6 Students' approach to learning and teaching activities:

Based on the Constructivism theory, and how learning activities take place, there are two student approaches to learning:

A. Surface Approach.
B. Deep Approach.

Each one of these approaches represents students' attitude and behaviour during the action of learning and teaching, in addition to what they expect to get from their learning activities. Different researchers have studied these approaches and each one has described them differently.

1.6.1 Surface Approach:

This approach represents one type of students, who conduct their learning activities, not to acquire new knowledge or skills, but to complete the task with minimum involvement, and try to reproduce what other people said or presented; in general they deal with the learning materials in a superficial manner.

According to Cotton (1985) "the aim of the surface approach is to reproduce what other people said". So, through the surface approach, students act as a reflection board and reflect what other people deliver without any modification and contribution. On the other hand, Fry et al (1999) claim that surface approach

" is typified as an intention to complete the task, memorize information, make no distinction between new idea and existing knowledge, and to treat the task as externally imposed".

So, through such approach, students deal mainly with facts and without the intention to understand the whole structure of the knowledge and ideas. Usually, students with this approach do not try to interact with the new information and integrate it with the existing knowledge structure. Therefore, a surface approach is typified by dealing with the learning materials in a superficial manner. Students typically do not interact with the materials or try to understand the underling structures.

In general, through the surface approach students just:

2- Reproduce what other people said or what they read.
3- Accept others ideas and information passively.
4- Direct their attention to how others will asses their works, and concentrate on the assessment requirements.
5- Try to memories facts only without any modification and implication.
6- Deal with the learning activity in a superficial mode, without concentrating on the patterns.
7- Conduct the learning activity without reflecting on their knowledge and experience. (Cotton 1985)

1.6.2 Deep Approach:

This approach is the opposite of the previous one, and reflects other types of students who enter their learning activities with different intention. Through such approach, students conduct their learning activities with the intention of acquiring the new knowledge or skills, and interact with them actively.

For Cotton (1995) " The deep learning approach turns other people's ideas into [our] own structure of knowledge. This is a process of active transformation". So, the students own the information, and modify and integrate it with their own personal knowledge structure, and make it personally meaningful (Nicol 2000). Therefore, through the deep approach, students' participation is active, and understanding the underlying structure of the knowledge and skill is aimed at

relating parts to one another, and integrating them with the prior knowledge and experiences.

In addition, Fry et al (1999), claim that the deep approach reflects the student's intention to understand and seek meaning by conducting such action which directs him/her to relate new concepts to existing ones, and to distinguish the new experience from the existing experiences. With the deep approach, the leaner also critically understands the new concept in full details by determining and evaluating the key themes in it. Therefore, students aim to gain the most from their learning experience, and they acquire facts not as isolated entity, but in a meaningful context (Fry 1999).

So, students approach their learning activities via deep approach if they want to gain the maximum meaning from their action and to understand the whole structure of the new knowledge and idea, and relate it to their existing knowledge. Therefore, the student's participation becomes active, and the facts are integrated within the context, and acquired within the new knowledge and ideas.

In general, through the deep approach, students could: (Cotton 1995)

1- Aim to understand the materials for the sake of understanding.
2- Interact with the provided materials.
3- Connect the learning activity to the prior experiences.
4- Create and utilise patterns to integrate the new idea and information.
5- Connect and relate different elements from the learning activities to each other.
6- Deal with argument not as fact, but try to understand the logic behind it.

1.7 Characteristics of Students' Learning practice:

Viewing the learning environment as a setting of acquiring knowledge and developing skills, which could result in modifying the existing knowledge and experiences of the learners, emphasises different characteristics of the students' learning activities and attitudes:

1- The learning activity is considered by cognitive psychologist as an active, constructive, and goal-oriented process which relies on the mental activities of the learners (Shuell 1986).

2- The outcome(s) of the learning activities as organised process may not modify the whole existing knowledge and experiences, but the modification could be partial, particularly if the existing knowledge is more advanced than the new one (Shuell 1986).
3- During the constructing activities, the learning process becomes a cumulated process, which builds upon the existing knowledge and experiences; therefore, we cannot consider any learning action as isolated act.
4- While students construct, organise, and re-organise their own knowledge and experiences they are interacting actively with the new information in order to own it and make it "personally meaningful" (Nicol 2000), which could modify their conceptual framework (Biggs 1999).
5- This constructive view of the learning process, in which students are constructing and reconstructing information output by modifying, revising, relating ideas to each other, places the student in the centre of the learning environment (Nicol 2000).

1.8 Conclusion

In general the two actions, learning and teaching, are interrelated, and each one is depending on the successful completion of the other. Student's active participation cannot occur unless teacher facilitates the learning/teaching environment. Therefore, the student's and teacher's responsibilities are highly important, teacher in preparing and modifying the environment according to students' condition, and students in adapting and modifying the provided knowledge and skills in order to make them a personal entity.

Therefore, the educational setting in the design studio has to be considered as learning environment, in which design tutor and students share the responsibility in creating and enhancing the learning environment. This type of environment emphasises the role of design tutor as facilitator of the design studio, and the student as active participant in such environment. This new setting has implications for the provision of knowledge and skills which design tutor has to modify according to the students' status, and students have to be active in their adaptation actions to integrate these knowledge and skills with their personal

knowledge and experiences. This conclusion raises the argument as: how students can learn from their experience; which is explained in the following section.

2 Learning from Experience

2.1 Learning and Experience:

The cognitive and behaviour learning theories stress the role of the environment in modifying the learner's behaviour. On the other hand, the learners also play a role in formulating the learning environment and adapting its outcome. In addition, they also stress how learners acquire the knowledge and improve their skills. But the means for such active participation and modification was missing. According to the experiential learning researchers such as Dewey, Lewin, Piaget, Kolb, and others, the learner's prior experience could provide this means, and become as the main driving force behind learners' active participation (Kolb 1984). The importance of the learners' prior experience lies in the fact that it allows the learners to come across the result of their own input, and to identify the effect of their personal experience in shaping the learning environment. The learner's role in these activities could reach the level of direct involvement in organising the learning setting. So, integrating the learner's prior experience with the learning activities could be vital in present-day society. Without doubt, the learners acquire many different types of experience from their daily lives, and integrating theses experiences can affect and enhance their learning activities.

The format of this integration will be presented in the light of experiential learning theory, which aims to create the connection between learning environment and learner's life. Different investigations by: Dewey, Lewin, Piaget, Kolb, and others have contributed to the development of this theory. Each one has approach the issue from a different perspective.

2.2 Experiential Learning theory:

The main concern of the experiential learning theory is: how to asses and evaluate the outcome of the prior experience, and integrate it with the traditional education system (Kolb 1984). As defined by Evans (1994)

> *Experiential learning means the knowledge and skills acquired through life and work experience and study which are not normally attested through any educational or professional certification (p 01).*

Along the same line Kolb (1984) claims that the experiential learning model tries to create a framework to examine and support "the critical linkages among education, work, and personal development" (p 04). Therefore, the ultimate view of this theory is to connect the classroom with the learner's daily life, and introduce personal experience into educational institutional boundaries.
For Kolb and other researchers, the introduction of the experiential learning theory is not to propose another learning theory beside the existing theories, the behaviour and cognitive, or to supersede them, but rather to propose through this theory "a holistic integrative perspective on learning that combines experience, perception, cognition, and behaviour " (Kolb 1984: 20-21).

So, for Kolb, the importance of the experiential learning theory derives from the following:

1- It creates a framework to connect education, work, and personal development.
2- It creates a foundation for an approach to education and learning as life long process.
3- It creates a reliable connection between the real world demand and the environment of the classroom.
4- It converts the working place into a learning environment, in which the work could be considered as learning and accredited.
5- It stresses the role of the traditional educational system and indicates how to modify it to reflect the actual society's needs.

Furthermore, experiential learning theory considers the learning action as learning "by doing" and differentiates it from the learning mode of learning *"to do"* something. While the former is an active teaching technique that is part of the student-centred model of learning, the latter is an action to learn a skill by acquiring some knowledge, perception, and physical movement, in order to carry out a specific skilled performance, (Cotton 1995). There are three models of the experiential learning process developed by different researchers and are considered as the early generation of the experiential learning theory. The fourth one, developed by Kolb is the latest. The following is an outline of the four theories.

2.2.1 Action Research and Laboratory Training by Kurt Lewin:

Lewin's work is oriented toward social psychology and experimental learning and training, from which emerge the laboratory-training method and the T-group (Kolb 1984). This research aims to develop a practical approach in order to integrate personal value, gained through life experience, with instructional standards on the basis of valid information, (Kolb 1984). In addition, Lewin is concerned about how to integrate the learning-by-doing model, which could be represented by the laboratory training, with the experiential learning, which utilises the learner's prior personal experiences. Therefore, Lewin tries to pull together the personal experiences and the actions of the students in order to allow them to use their prior experiences and conduct their actions in professional manner. Lewin's experiential learning model consists of four stages: (Kolb 1984)

The cycle starts with a "concrete experience" in which the learner is involved in an active experience; after the completion of this experience, the second stage starts by reflecting upon that experience and looks at it from different perspective: this stage is called "observation and reflection". The observation and reflection outcome(s) are combined to create a "theory"; that is the third stage called "formation of abstract concepts and generalization". This theory represents these outcomes. In formulating this theory, the learner tries to convert the second stage outcomes into abstract concepts and general role, which leads to the fourth stage, "the testing implications of concepts in new situations" acting as criteria for testing the theory at the next and new experience (Figure 01).

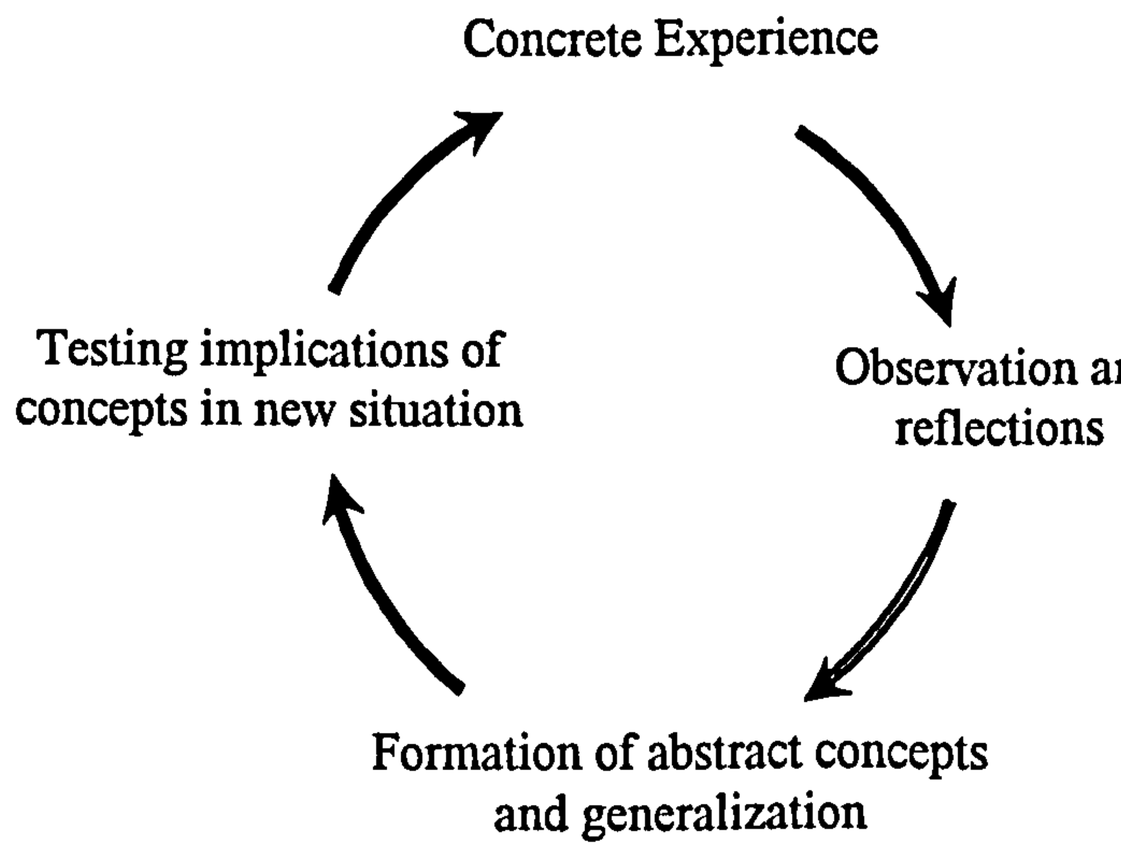

Figure 01: Lewinian Experiential Learning Model (Kolb 1984).

Kolb (1984) argues that Lewin's model emphasises two important aspects: First: it emphasises on "the here-and-now concrete experience to validate and test abstract concepts" (p 21). Second, it introduces the active research and laboratory training as a learning model, which are based on feedback processes, which means, immediate feedback while the learner is in the middle of the experience, or as Schön called it "reflection-in-action" (Schön 1982). The learner conducts the experience, and at the same time reflects upon it. Therefore, the experiential learning model of Lewin stresses the role of immediate feedback a means of making the learning activities live, and encourages the learner to be active and to use his/her prior experiences during these activities. The reflection-in-action thinking model will be explained in more details in another section.

2.2.2 Experiential Learning in Higher Education, *by John Dewey:*

Dewey raises the issue of prior learning, gained through the learner's daily life, as a means of widening the opportunities for the minorities and other sections of the society that could not have the ability to enrol in the formal education. He also tried to overcome some of the problems of the traditional educational system. The latter ignored any type of experience gained outside the boundaries of the educational setting. Consequently, Dewey called for accrediting these prior experiences that he considered as other sources of education, and called them "prior learning" (Kolb 1984). So, the prior learning links the formal education with adult life. Dewey's learning model concentrates on the developing of the higher education to match and reflect the actual needs of the profession and to match the demands of the society. In that perspective, the new format of the higher education has to allow learners to integrate their personal life experiences with their learning activities.

For the learning model, Dewey's have significant similarities with Lewin's, but do not call for immediate feedback; instead, it advocates a delay feedback. Dewey's experiential learning model consists of three main stages illustrated in Figure 02, (Kolb 1984):

- Observation of the surrounding condition: A this stage the learner tries to reflect upon the current situation and increase his/her understanding.

- Recalling Knowledge: At this stage, the learner collects information from the past, of what has happened in similar situations, and collects data and information about these events. This stage advises the learners to consult as many resources as they can, and to widen their vision of the information resources. These resources could vary from reading a book to obtain abstract information to consulting more experienced persons to see how they tackled similar experiences.
- Judgment: At this stage the learner tries to combine the outcomes of the preceding stages, in order to formulate criteria for future experiences.

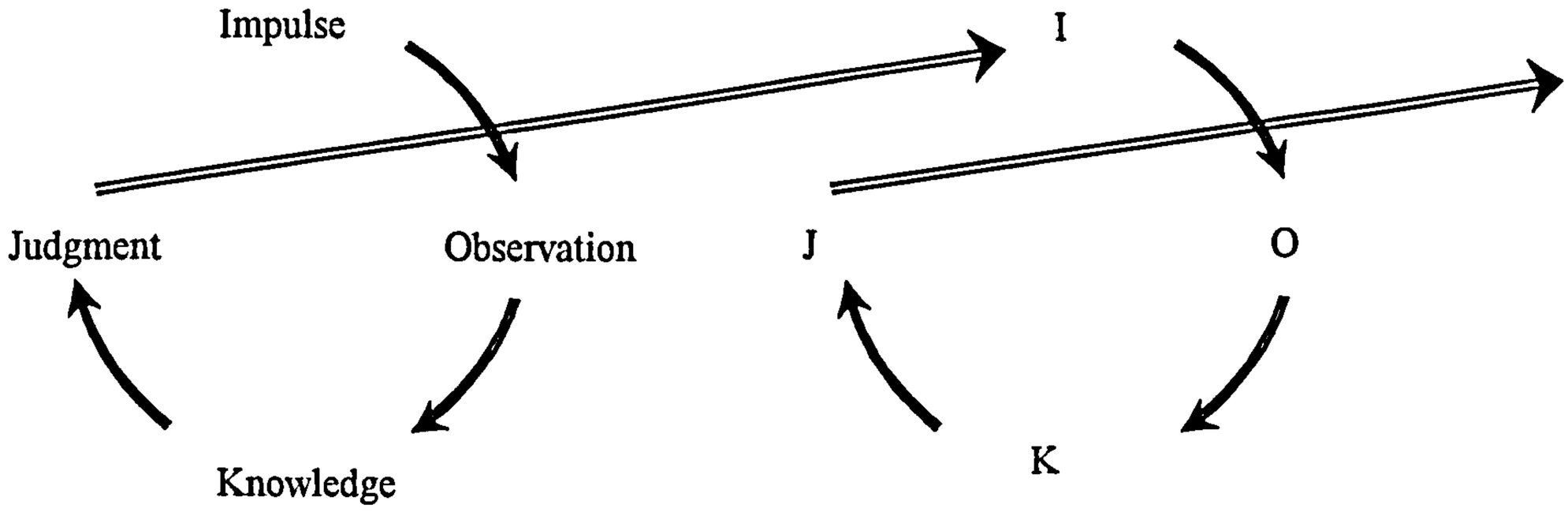

Figure 02: Dewey's Experiential Learning Model (Kolb 1984).

In other words, each stage in this learning cycle represents a specific action the learners have to take in order to complete the cycle and benefit the most from their experience. The first stage is a kind of reflection upon the surrounding condition, in which the learner tries to increase his/her understanding about the past experiences. This stage followed by that of data collection and recall of information relates to the situation. This consultation action covers different resources from which the learner could acquire knowledge. The judgment is the final stage in which the learner formulates the theory of how to integrate the outcomes of the previous stages and use them in the new experience(s).

In general, Dewey's learning model calls for delayed feedback, encourages the learners to reflect upon their daily life experiences, identifies the reason behind any unsuccessful experiences, and tries to overcome the causes behind them. Which is similar to the second thinking mode of Schön, the reflection-on-action (Schön 1982).

2.2.3 Learning and Cognition Development, by Jean Piaget:

To draw a line between the three models and distinguish Piaget's model from them, we have to describe each one along the lines suggested by Kolb (1984):

- Dewey's model from the philosophical perspective of pragmatism;
- Lewin's model from the phenomenological perspective of Gestalt psychology;
- Piaget's model from the rational perspective.

For Piaget, the cognitive process in childhood is considered as the key to understanding the nature of human knowledge. In addition, learning, or in Piaget's terms, intelligence is shaped by experience, and the learner is involved in the learning cycle by the interaction of the individual with his/her environment (Kolb 1984). The adaptation or the modification of the learning occurs when a mutual interaction between new concepts or schema and existing experience take place, or when the interaction between the new experience and the existing concept or schema also occurs (Kolb 1984).

Piaget's learning model cover different stages of human life, from childhood to the adolescence with each stage reflecting how humans deal with the new experience and the new concepts.

2.2.4 Experiential Learning Theory, *by David Kolb:*

This theory is built upon the works of other experiential learning researchers, such as Dewey, Lewin, and Piaget. The essence of Kolb's theory lies in the learning definition, in which Kolb argues, "learning is the process whereby knowledge is created through the transformation of experience" (1984: P 38). This definition raises different aspects related to the experiential learning theory (Kolb 1984):

- The experiential learning is concerned with the process more than the product.
- The nature of knowledge, from the experiential learning perspective, is not an independent entity ready for transmission, but is able to be transformed and modified.

- The learning activities affect the experience in its subjective and objective forms.
- To understand learning we have to understand the nature of knowledge and vice versa.

Consequently, Kolb developed his theory based on Lewin's learning model, which consists of four stages (Cotton 1995): (Figure 03)

- First stage: Concrete Experience

At this stage, the learner conducts or is involved in an active experience, and starts to use his/her existing knowledge, and at the same time additional knowledge may feed in during the process to fulfil the new experience requirements.

- Second stage: Reflective observation:

At this stage, and after the completion of the experience, the student has to reflect upon what has happened and look back to the nature of experience he/she went through. This reflective observation could be conducted by one, and is considered as unique opportunities for the learner to extract a useful part from this experience, and integrate the new experience and understanding with the existing knowledge.

- Third Stage: Abstract Conceptualisation:

At this stage the learner tries to build the "theory", which represents the outcome of the previous stages. This theory can be built by consulting different resources such as: books for abstract data, a more experienced person for advice, or "consult general roles" (Cotton 1985 b). So, through this stage the learner combines and puts together others' ideas. Depending on the type of profession, the action could be giving students new information if it is in teaching setting, or coaching if it is in training setting, or consulting a book if it is self-instruction setting. In general, it is the stage in which the learner tries to collect new information and compare it with others.

- The Fourth Stage: Active Experimentation:

This is the last stage of Kolb's learning cycle, in which the learner starts with active experience, followed by reflective observation, followed by building the theory, and ending with the planning stage: what to do next. So, at the new experience, the students could improve their behaviour and attitude based on the outcome(s) of the last experience. Therefore, this is the stage of "the practical planning or pragmatic stage" (Cotton 1995 b, p 132).

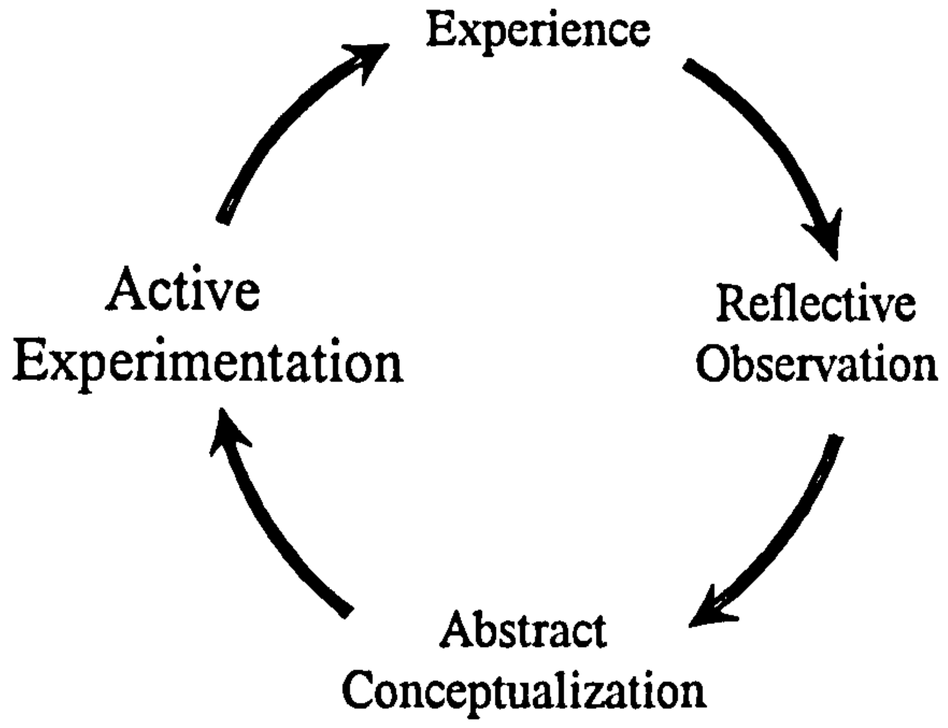

Figure 03: Kolb's Experiential Learning Model (Kolb 1984).

This learning cycle raises different aspects related to the experiential learning:

- Learners are actively involved in exploring the experience.
- Reflection has to be critical and selective.
- Learners have to value the process of exploring and learning, and be committed to this process.
- The process of learning is based on learning activities and guided by the teacher or trainer, and must not be left to random discovery.
- In the process of learning there must be a stage of independence for the learner.
- To maximize the benefits, the learner has to be exposed to the experience.
- To encourage learners to value their experience, they have to feel secure and receive the necessary support.
- The learning process is a linked cycle of activities that need continuous feeding and support from the teacher. (Cotton 1995 a)

2.3 Characteristics of the experiential learning:

In general, this chapter devoted to the study of a certain number of theories, it is worth outlining and discussing the various characteristics of experiential learning:

1. *Learning is best conceived as a process, not in terms of outcomes.*

From the experiential learning theory's perspective, the ideas are form and reform through experiences, so they are not fixed and immutable elements, as considered by the behavioural theory of learning. Therefore, learning is a process from which the concepts are derived, and continuously modified and organized, by experiences (Kolb 1984).

2. *Learning is a continuous process grounded in experiences:*

Since acquiring knowledge and developing skill are the main concerns in any learning situation, knowledge is continuously derived from and tested out in the experience of the learner (Kolb 1984). In consequence, no learning experience is isolated; but it has been affected by preceding experiences and may affect or modify the one that follows it. As stated by Dewey:

> *... The principle of continuity of experience means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after . . .. As an individual passes from one situation to another, his world, his environment, expands or contracts. He does not find himself living in another world but in a different part or aspect of one and the same world. What he has learned in the way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with the situation which follow. The process goes on as long as life and learning continue.* (Dewey 1938: 35-44)

Therefore, the learning activities are a linking of parts and each experience is connected with the one that precedes and follows it. So, this kind of relationship highlights the essence of the experiential learning. In addition, an individual adapts the new idea through two mechanisms, identified by Piaget as

> .... *integration and substitution. Ideas that evolve through integration tend to become highly stable parts of the person's*

> *conception of the world. On the other hand, when the content of a concept changes by means of substitution, there is always possibility of revision to the earlier level of conceptualization and understanding, or to a dual theory of the world where espoused theories learned through substitution are incongruent with theories-in-use that are more integrated with the person's total conceptual and attitudinal view of the world.* (Kolb 1984: 28-29)

So, these mechanisms, integration and substitution, highlight the vehicles of the learning process, and how learners conduct the learning activities.

3. *The process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world:*

Generally speaking, any learning process is conducted to resolve a certain conflict, either between concrete experience and abstract concept, or conflict between observation and action, as in the Lewinian model. For Dewey, the conflict is between impulse that gives ideas their "moving force and reason that gives desire its direction" (Kolb 1984); for Piaget, how argues that the main two processes in the learning are the accommodation of ideas to the external world, and the assimilation of experience into the existing conceptual structures (Kolb 1984). The twin processes " are the moving forces of the cognitive development" (Kolb 1984). These views represent the dynamics of the learning process, which is " by its very nature a tension- and conflict- filled process. " (Kolb 1984)

4. *Learning is a holistic process of adaptation to the world:*

From this view, the learning is not considered as an activity which aims to acquire specific knowledge only or to develop skills, but it is a processes which encompasses other activities such as: creativity, problem solving, decision making, and attitude change that focus heavily on one or another of the basic aspects of adaptation (Kolb 1984). This focus provides "the conceptual bridges across life situations such as a school and work, portraying learning as a continuous, lifelong process" (Kolb 1984).

5. *Learning involves transactions between the person and the environment:*

This form of transaction between the person and the environment implies deep relationship, which becomes " a more fluid, interpenetrating relationship

between objective conditions and subjective experience", when such relationship occurs, " both are essentially changed." (Kolb 1984) This type of relationship could change not only the learners but also the environment surrounding them and the learning setting. Given of the nature of the learning setting, which is considered both active and self directed (Kolb 1984), the learners could modify the learning environment and adapt it according to their needs. On the other hand, the learning environment could modify the learners' behaviour and values if they expose themselves to the learning environment. Therefore, the learning setting is a two way process.

6. *Learning is the process of creating knowledge:*

While the learning is a process of transaction between the person and the environment, the product of this transaction is the knowledge. The transaction occurs between two types of knowledge, social and personal. While the former is "the civilized objective accumulation of previous human cultural experience", and the latter is "the accumulation of individual person's subjective life experiences" (Kolb 1984). Therefore, knowledge is created through this transaction "between these subjective and objective experiences in a process called learning" (Kolb 1984).

2.4 Conclusion

This section has examined the nature of the students' active participation, and how they deal with the provided knowledge and skills in relation to prior experiences. Introducing the prior experience could modify students' attitude and behaviour during the learning activities.

This involvement raises the importance of the reflective action as a means for integrating prior experiences with the learning activity, in which the reflection, either in or on, creates the bridge between different learning activities.

Introducing the action of reflection lays the ground for the following section in which the reflection on experience is the main theme.

3 Reflection on Experience

3.1 Introduction

The second stage in Kolb's Learning cycle is the reflection action. At this stage the learner aims to evaluate his/her past experiences, and view these experiences from different perspectives. In addition to that, he/she tries to learn as much as possible from these experiences by identifying the important aspects, which could improve his/her practice in the future. The reflection action is considered by Boud et al (1984) as an "active process of exploring and describing which often leads to very unexpected outcomes". From this definition we can identify the importance of reflection in any learning activities. In order to complete the learning cycle and benefit the most from learning activities student has to conduct the reflective action (Gibbs 1988). The definition emphasises certain aspects for the reflection action to be useful:

1- The process has to be active, which indicates that the student has to conduct the activity and engage in it as an active participant. In addition, ready to contribute to the action, provide new input, and accept any modification in his/her behaviour or personal structure knowledge as result of reflection action.
2- This process aims to explore and describe something, which was unknown for the learner. The learner, therefore, must have the incentive to conduct the action, and own the means for such exploring and describing. This means could include an analytical tool for analysing the experiment and understanding it in depth. This understanding allows students to look at their experiences from different perspectives, and to re-use them in different contexts. So, the benefit could be applicable in different situations.
3- The engagement in active experience does not complete the learning action, therefore, the student has to know that there are other stages have to be completed for learning to occur.
4- The student cannot determine an agenda for the reflective action, but must conduct it and look at the outcome(s) with a fresh eye. This act

> could allow the student to discover outcomes (that) they may not have expected.

The importance of the reflection action could be deduced from the argument that: "it is not sufficient simply to have an experience in order to learn. Without reflecting upon this experience it may quickly be forgotten or its learning potential lost" (Gibbs 1988). So, for Gibbs, the experience itself is not sufficient for learning to occur, but the learning cycle has to be completed, and the learner has to pass through all stages for learning to take place, and for him/her to claim that he/she has completed the learning. Therefore, the reflection action allows learner to:

- Complete the learning cycle.
- Identify the current learning actions as experiences.
- Identify the outcomes of the learning activities in order to assess them and benefit from them.

Moreover, the existing of the experience in the learner's memories is not enough, but the learner has to conduct many actions in order to integrate the experience outputs in the structure of his/her personal experience.

In addition to that, the reflection process could reveal many interesting issues embedded in the experience, and the learner may not discover them until some critical reflection takes place. Boud et al (1985) claim that during the reflection process students "will discover and realize many things left undone, questions unasked and records incomplete."

Therefore, the reflection action allows learners to view their own way of practising. In other words, the way the learner conducts an experience may need some modifications and require critical analysis and adaptation. Therefore, the learner has to consider the reflective action not only as means of extracting the outcomes of the learning activities, but also as a means of assessing his/her own mode of practice. As Cotton (1995 a) claims:

> *If you are in the middle of things, your attention cannot be focused all the time on what is best for learning; you tend to get involved, so that selective attention starts to work and you may miss some essential point of experience. When you have the chance to see the events again you have a much better chance to balance and select from learning (p. 117)*

The author not only emphasises the importance of recording experience for farther action, but also the importance of considering the act of returning to a completed experience which could allow the learners to identify some important aspects, and view their own mode of practice. The practice mode, or how learners conducts their actions has a vital effect in any active experience.

3.2 Reflection Act

In this section we aim to widen our vision about the reflection activity, and try to identify the characteristics and propositions of this act in order to understand its role, and the way learners could implement it successfully in their learning activities.

3.2.1 Reflection Types

Form the experiential learning models by Dewey, Lewin, Piaget, and Kolb we can identify different types of feedback, or reflection, and at which stage of learning this type could be conducted. There are two types of feedback the learners are encouraged to conduct:

- Immediate feedback;
- Delayed feedback.

Each one of these types requires specific actions and attentions during the learning activities. Whereas the former requires the learner to be more active and to be aware of any needs for adjustment and amending of the behaviour during the learning activity, while trying to conduct a critical and continued analysis of the experience during the experience, the latter calls for reaction after the completion of the experience. In the delayed feedback the learner has to reflect upon his/her past experience before conducting new experience. Along the same line of thought, the research on reflection activity identifies three types of reflection action; the first one is identified by John Cowan (1998), and the last two by Donald Schön (1983). The reason behind imposing such framework on the reflection act is to emphasise the important role of such action at various learning stages. So, the learner has to devote a lot of efforts at different stages during his/her learning activities, either before, during, or after. Therefore, the reflection action could be categorised accordingly.

3.2.1.1 Reflection-for-action

This type, which is identified by Cowan (1998), calls for action before conducting the experience, and encourages students to prepare themselves for the experience. As put by Cowan, the reflection-for-action is:

> *A reflection which establishes priorities for subsequent learning by identifying the needs, aspirations and objectives which will subsequently be kept prominently in the learner's mind.* (p 37)

Therefore, this type of reflection encourages students to predetermine goals, and intentions for conducting the new experience and determine what their expectations are (Nicol 2000). Moreover, the reflection-for-action is considered as means for preparing and warming up the students for the experience. In general, reflection-for-action encourages students to prepare themselves before conducting the learning activities by:

- Pre-determining goals for the new experience.
- Defining their expectations of the results of the new experience.
- Identifying the needs, or the actions, in order to conduct the experience successfully.

3.2.1.1.1 Techniques for Reflection-for-action

These techniques have been developed by Graham Gibbs (1988), and aim to prepare students for their experience, so they could make the most of it.

a. Action plans:

With this technique, the students prepare a list of things to do. This list could act as general guidelines for the action in hand.

b. Setting objectives:

With this technique learner sets objectives for the future action before actually conducting it. That is seen as a way of controlling and directing the action toward the best direction. The student asks him/herself a question like: "After this experience I will be able to. . ." The learners therefore specify what will have been learnt (Gibbs 1988). The technique is an excellent means of directing

the learner's attention toward the important aspects he/she expects to cover or the results he/she expects to obtain.

c. Designing experiments:

The aim of this technique is to get student involved in designing the experiment rather than conducting the action. Of course the learner cannot design the whole experiment, but he/she could complete some details left by the teacher. It is this involvement that creates a base for discussion with teacher. In this way the students will have their input in the experience before conducting it.

d. Observation checklist:

This checklist aims to help the new student who does not know what to look for in the experience, and who has not conducted similar action in the past. Therefore, this observation checklist could guide student to identify the main aspects in such experiment. Moreover, the checklist could be considered as a documentation of how others conducted similar actions.

e. Devising criteria:

This technique encourages students and teacher to try to create an outline of the criteria, on which the experience could be assessed and evaluated. So, devising criteria could help student to conduct the action effectively by identifying the criteria on which their action will be assessed.

f. Learning contract:

This technique encourages teacher and students, or group of students to write a contract for their learning action, and specify their criteria, objectives, goals, and other conditions that mange their learning activities. This contract could direct the learner to the best direction, and provide students with outlines of what they expect from this action. In general, this technique combines all the others for this type of reflection.

g. Action research:

At this technique, Gibbs (1988) aims to improve the learner's ability to practise, and how he/she could conduct the action effectively. It is an application of the experiential learning cycle of Kolb which divides the learning action into four stages, starting with observing what is happening or the current situation, and followed by the stage of conducting the action. The third stage is observing the impact of the new action on student's behaviour, and finally, reflecting on this effect and organizing it for future planning and action. The action research aims

to help learners to overcome some of the practical problems they face, and how to improve their work.

3.2.1.2 Reflection-in-action

This type of reflection refers to the immediate feedback, either during the action or immediately after its completion (Quayle 1998). In addition, this type calls for immediate adjustment of the learner's behaviour and action during the experience, which, at the end, could improve the learner's practice and action (Quayle 1998). For Schön (1983) this type refers to the actions that student did during the active experience, and to the way the student modifies his/her behaviour to improve the learning condition.

This type of reflection encourages learners to activate several types of thinking modes while they are conducting the action. These thinking modes modify the learners' behaviour, and may direct them toward immediate adjustment as a response to the situation in which the learners find themselves. In addition, Cowan (1998) claims that this type of reflection: ". . entails as much anticipative thought and analysis as retrospective review" (p 36). Therefore, reflection-in-action calls for improving and adjusting the learner's performance. In general, Lewin and Kolb's experiential learning model call for such reflection.

3.2.1.2.1 Techniques for reflection-in-action

According to Gibbs (1988), these techniques encourage students to increase their awareness during the experience, and involve immediate feedback while the action is in progress. This awareness could allow students to adjust and modify their behaviour and action to increase their effectiveness and complete the action successfully.

a- Logbooks:

This technique is used for recording what is going on in the experience as it happens. So, it is a detail-recording document of what has happened in the experience, which could be used later for analysis and interpretation.

b. Listening Exercises:

This technique aims to improve student's ability to respond to, and recall what others said in order to adjust their behaviour while they conduct their action.

c. Questions:

During any active experience, some questions may emerge in the middle of the action; however, trying to answer or respond to them will interfere with the process. The technique therefore aims to build the student's awareness of the existence of such thoughts, and how to deal with it. Students in such situation may try either to respond to these questions, which will interrupt the process, or ignore them, which may cause the loss of some important aspects related to the experience, and that may have important implications on students' practice.

d. Increasing awareness of the feeling:

This technique aims to increase the personal awareness feeling, and how to express it in a clear manner to others. The personal feeling reflects the learner's attitude during the action, and represents the actual behaviour.

e. Silent demonstration:

This technique aims to allow students, while observing live demonstration without an accompanying description, to analysis the action and to create a full description of what has happened. This silent demonstration allows the learners to criticize and interpret the whole action according to their own experiences and knowledge.

3.2.1.3 Reflection-on-action

This type of reflection calls for delayed feedback after the completion of the act, and before conducting new action. In comparison with the reflection-in-action, this type does not call for immediate adjustment and modification of the learner's behaviour and action according to the immediate conclusion of the experience, but rather it calls for modification and adjustment of the behaviour after a long time, which allows the learners to disassociate themselves from the context of the experience and, in addition, to look at the experience from a new and fresher perspective. Moreover, this type allows the learner to reflect not only on the immediate and latest experience, but also to combine more similar experiences and deal with them accordingly.

As Cowan (1998) argues, " Reflection-on-action mainly looks back on the action contained in past experiences, it attempts to analyse and summarize the past experiences" (P 36), and the outcomes of the actions of analysis and summary is used to "extract generalizations which will be of future use." (P 36)

Therefore, this type of reflection differs from the preceding one by calling for adjustment and modification of the learner's behaviour, not for the experience in hand, but for the one in the future, and it considers the one at hand as close case. In general, Dewey's experiential learning model calls for such reflection type, and encourages learners to connect all their previous experiences, modify and adjust their learning practice before conducting any new experience.

3.2.1.3.1 Techniques for Reflection-on-action

With this set of techniques, Gibbs (1988) aims to present some methods, which may help students to conduct a reflection upon the completed experiences, and re-consider some of their past experiences for new investigation. Moreover, some of these techniques could be considered as recording techniques to capture and document the experience for further reflective purpose.

a. Diaries:

A diary differs from logbook, in that the former is written after the completion of the action, while the latter is during the action. The diary could include a full description of the past experience, and the student's feedback about it. Finally, the diary can take a format of formal or informal letter, but not a report.

b. Using video and audio recording:

This technique aims to capture the complete event, even some emotional expression, like the facial one, for students to get a complete picture of the event. The video and audio recording could act as reminders for student to remember most of the experience in details, in order to reflect upon it, and analyse it critically.

c. Peer appraisal:

This technique emphasises the peers' role in providing a feedback to each other. Other students could observe their friends in the process of conducting the act, and reflect upon their action; in addition, this provides them with valuable feedback to improve their practice, and direct their attention toward some aspects they may have ignored or dismissed.

d. Structure discussion:

This technique calls for imposing a structure on the students' discussion, instead of running or conducting unstructured discussion, which may direct the students toward non desirable direction and concentrate on some aspects that may not

benefit them in their learning activity. The structured discussion directs students toward the most beneficial directions, and covers different aspects ranging from identifying the main parts of this experience, to analysing the action and providing feedback to other students. Therefore, the discussion could be useful and rewarding for all participants.

e. Structured de-briefing:

This technique is similar to the previous one, but it imposes a more focused and specific structure on the discussion, or the de-briefing. This structure consists of:

- Description.
- Feeling.
- Evaluation.
- Analysis.
- Conclusion (general).
- Conclusion (specific).
- Personal action plan.

f. Self- assessment:

This technique stresses the role of self-assessment which considers other sources of feedback as input for self-assessment. Therefore, the learners have to know that every feedback they receive from others have to be assimilated and adapted by them in order to be affective, and the self-assessment is the main player in modifying the learners' actions and attitudes.

g. Reflection checklists and questionnaires:

This checklist and questionnaire aims to direct students' attention and reflection toward the main aspects in the reflection activity. In addition, the questionnaire acts as a guideline for learners through the reflective process.

h. 'Shared time' and 'mutual interviewing':

This technique aims to control the time of the conversation for the group. Controlling the time could reflect on the quality of the discussion and improve its outcomes; in addition, it may allow all members of the group to share their observation and express their view clearly. Therefore, shared time could impose time parameter to allow equal opportunities for all members to contribute in the reflection action. A mutual interviewing is similar, but it allows the listeners to

ask non-directive questions, in order to investigate the experience in more details.

i. Modelling reflection:

This technique provides learner with an example of how to conduct reflection, in order to overcome the difficulty that some students face when they try it on the first time. So, in this model, the teacher or trainer, tries to demonstrate critical and analytical reflection on a specific experience.

To explain these types in architectural way, one may consider a simple example stated by Nicol (2000), which represents the three types of reflection. The regular example in most architectural literatures is the protocol analysis, in which empirical design task has been recorded and encoded to describe the design activity. This example is selected because of its simplicity. Nicol (2000) says:

> *Imagine that a group of students have been asked to carry out a site analysis. Before going to the site they might be asked to spend some time, either alone or in groups, identifying the goals to be achieved when visiting the site, the questions they might ask about that site in relation to the needs of the users of the proposed building and how they will carry out their analysis (reflection for action). While on the actual site, the students might record in a journal their initial impressions of the site, how they go about analysing and interpreting the site in term of user needs, and the answers to the questions they had identified beforehand, plus any unexpected observations and new questions that emerge (reflection in action). Upon their return to the studio the students might- either alone or in groups- re-examine the scope and relevance of their original questions, and they might evaluate their methods of carrying out a site analysis and how successful they were in meeting their original goals (reflection on action).* (P 16)

3.2.2 Reflection Properties

After explaining the nature of reflection action, and the categories of this action, this section is devoted to the discussion of the properties of the reflection action. These properties highlight the role of each actor during the reflection action, student or teacher, in addition to other characteristics of this action.

First: The learners are the only ones who can learn from the reflection action; in addition, they are the only ones who can conduct reflection upon their

experience and past actions. The teacher can intervene in different stages, and in various ways, but just to asses. Also, the teacher has only access to the materials that the students reveal and express. These materials consist of thoughts and feelings; so, whatever the student reveals the teacher can access and observe, but not vice versa. Therefore the student is in total control (Boud 1985).

Second: The reflection action is pursued with intent. So, this act is a well-organized activity, which is conducted in clear intention to develop oneself, and is directed toward achieving specific goals (Boud 1985). However, that does not mean that the outcomes could be predictable, and the student know what they could get exactly from the reflection action (Boud 1985).

Third: The reflection action involves different aspects and parts from the learners; it involves their feelings and cognations, in which they are inter-related and inter-active. Negative and positive feelings could affect the whole process of reflection; the negative feeling can create and generate a major barrier toward learning (Boud 1985), leading to false interpretations, deformed perception, and thus weakening the intention for development. On the other hand, positive feelings can enhance and promote the learning process, and encourage the learners to make the most from their learning process. Therefore, the effectiveness dimension of the feeling has to be considered in the learning activities, and in assessing others' learning activities (Boud 1985).

3.2.3 Reflective Elements (Stages)

This part is devoted to the presentation the elements of reflection action from the student's perspective, and highlights the stages the learner has to pass through for the reflective action outcome to occur (Boud 1985).

Stage 1: Returning to Experience:

This stage aims to reconstruct the event by recollecting the experience materials, and replicating the event in the mind's eye. In the reconstruction process, the student tries to reconstruct the event on the basis of what has actually happened, and has been experienced, rather than what the student wishes had happened. Furthermore, the learner will concentrate on the details that will emerge during

this process, and refrain from any judgment. These details, during the experience, either were ignored, or noted by passing. In addition to that, the reason for reconstructing the experience is to observe exactly what has happened during that action, besides noticing what occurred and what was the reaction of the student at the event.

Stage 2: Attending to Feeling:

During any experience, the learner's feeling, either positive or negative, could create major constraints on the reflection action, because negative feelings could encourage learners to neglect many aspects in the reflection action. On the other hand, positive feelings direct the learner to collect the good parts of the event, and rebuild the action in better shape for successful reflection. Therefore, this stage concentrates on two aspects:

- Utilizing positive feelings;
- Removing obstruction feelings.

Stage 3: Re-evaluating Experience:

This is the last stage of the reflection action, in to which most learners jump directly before completing the preceding two. At this stage, the learner evaluates and assesses the past experience based on the outcomes of the preceding stages; in addition, the re-evaluating process involves re-examining the experience according to the learner's intent. This stage could be processed through four sub-stages that direct the learner through the re-evaluation process, and allow him/her to increase the value of the reflection outcomes. The sub-stages are:

- Association: at this stage, the learner tries to associate the new knowledge and feeling to the existing one. This stage usually results in determining if the new knowledge is useful or not.
- Integrating: after associating the new knowledge with the existing one, the learner has to integrate it within an existing conceptual framework.
- Validation: at this stage, the learner determines the authenticity of the ideas and feelings that have resulted from the integration stage.
- Appropriation: this is the last stage, in which the learner tries to adapt the outcomes of the previous stages, and integrate them in his/her repertoire of behaviour.

3.2.4 Reflection Activity's Outcome(s)

Before discussing what we can expect from the reflection activity, we have to stress the fact that reflection action is an experience by itself, which has objectives to achieve; in addition, it makes us ready for a new experience. In general, the expected outcomes of this action could cover different aspects ranging from acquiring new knowledge and skills, to modifying and changing the learner's behaviour (Boud 1985).

1- New way of doing and conducting some actions.
2- Understanding an issue from different perspective.
3- Acquiring new skill or developing an existing one.
4- Resolution of a problem.
5- New cognition map may emerge that represents the outcomes of the reflective action.
6- New set of ideas may be identified as a result of the new cognitive map or other changes.
7- The changes could be small or large, which could cover such different aspects as cognition, behaviour, or learner's structural knowledge.
8- Learner could express readiness for application, and commitment for action.

3.2.5 Assisting in the Process of Reflection

During the reflection process, learners can conduct the action in a more effective manner if they get support and assistance from a more experienced person, such as a teacher or educator. This support could take different formats based on the reflective stage the learner is in; but the supporter has to understand that what he/she offers should be based on the learner's priorities only. In general, Boud et al (1985) claim that the task of the support teacher could be:

> *To provide context and space to learn, to give support and encouragement, and listen to the learners and provide access to the practical devices which may be of use. They may also at times act as*

> *sounding board and help the learners clarify intention and set goals. Of course, all this must be within the context of the learner's needs and interests.*(P 38)

3.3 Conclusion

In general, the investigation of the natural of the reflecting activity reveals practical applications by proposing different types of techniques. These techniques could be utilised by both teacher and students; for the teacher, to facilitate the learning environment for the students to complete their learning activity, and for the students to benefit the most from their prior experiences, and bridge the gap between different experiences.

Therefore, due to the nature of the reflection activities, students' participation have to be active, and they have to interact with the new knowledge and skills in order to own them, in addition to integrating them with their personal knowledge.

4 Design Studies

4.1 Introduction

Design action has seized researchers' attention for many years. The mysterious nature of the action creates an unclear vision for understanding the act, and in the end prevents applying scientific methods to study and analyse it in order to improve it in practice and outcomes. The design act is a complicated one, as Dorst (1997) argues:"...design is a string of activities which can be both rational and intuitive, abstract and concrete, analytical and creative." This broad vision of the act encourages researchers to invent different research approaches to analyse this act.

Looking at design as creative act, directs the literature review to investigate how researchers in cognitive science have studied the creative act. Researchers have approached the creative act from different perspectives (Runco 1994):

1- Studying the creative process.
2- Studying the creative product.
3- Studying the creative person.
4- Studying the environment that enhances such creative act.

These research approaches set up the parameter for researchers not only in cognitive science, but also guide researchers in other disciplines to study any type of creative act, as is the case in engineering, architectural, art, for example. Considering design activity as creative act has many implications on the design research, but that does not prevent researchers to carry out research in developing a systematic explanation of the design action, and to try to "externalize the design process" (John 1969). In design literature, there are mainly two viewpoints regarding the design action, and the way we can look at the designer's mind in order to study this action and understand how their mind operates. These viewpoints represent different disciplines from which researchers came from (John 1969):

1- Designer as Black Box:

This view emerges from the cognitive scientist, and considers the designer's mind as a black box, and that the design process, which occurs in this box,

cannot be observed directly, but we can identify the input and the output. Some output(s) like drawings could provide the observers with a clue of what has happened in the designer's mind (Arnheim 1993). So, the black box viewpoint argues that we cannot observe the design process directly or intervene in it, but we can enhance it through different means. The design process is un-describable, and the designer cannot make the process explicit correctly, because it may lose its meaning and value (Lawson, 1997). Furthermore, John (1969) characterises the black box viewpoint as:

1- The output of the design process is governed by input received from the two sources: the problem in hand, and the previous problem and experiences.
2- The speed of the output could be increased if the designers considered some social aspect that could direct the process.
3- The capacity of producing the design output is dependent on the time that allowed for the designer to assimilate and manipulate the problem data.

In general, this perspective considers design action as a mysterious act, and looks to the designer's mind as a closed object. The observer cannot see what is inside, but the mysterious creative leap came from (John 1969). So, it is worth to study the act in more details within this parameter.

2. Designer as Glass Box:

This perspective emerged from the scientific domains, which aim to externalise the design process (John 1969), and to apply some scientific research methods in studying the design action. Rationalising the design action was obtained through imposing systematic description on the design process, in order to analyse and study the action in more detail. The glass box view builds upon the assumption that the design could be completely explicit (John 1969). The design model of analysis-synthesis is considered as the main design model for the glass box perspective, which we will discuss, and others as well, in the coming sections. John (1969) out lines the main characteristics of this perspective:

1- All design activities are alike; therefore, all variables and objectives are fixed in advance.

2- The analysis of the design problem has to be completed before proposing any solutions.
3- The evaluation process is logically conducted.
4- The whole design process is a systematic procedure, therefore, the sequences are predetermined and fixed, but they have different characteristics.

In general, considering the designer's mind as a glass box looks at the design process as transparent activity, which could be observed, and the actual sequences of the action could be identified and noticed. This rational perspective aims to impose a logical framework to externalise and explicit the design process, which at the end could be tested and measured.

The two views present the first generation of the design research, and in the following section we will discuss them in more details.

4.2 Design Models

Design researchers, in their contributions to study design process and analyse it in order to improve its practice and outcomes, have developed design models, or in Lawson's (1997) term maps. These models aim to decompose design process into specific stages, in which each one represents different moments of the cognitive process as a means to externalise the design process.

In the design literature, there are two main design models and both of them emerged from the two views of the designer's mind, either as the black or glass box.

First Model: Analysis-Synthesis

This model was developed by Markus (1969) and Maver (1970), and builds upon the view of the glass box. The model tries, as Ledewitz (1985) claims, to rationalize the deign-decision process. This model decomposes design process into three stages: analysis, synthesis, and evaluation. The whole sequence of the model is summarised by Ledewitz (1985) as:

> *. . . decomposing a problem into its element, adding an information content to each element drawn as far as possible from scientific work, and synthesizing . . . a solution by means of a set of logical or procedural rules.* (p 03)

Therefore, this model claims that the designer analyses the design problem, synthesises the solution, and then evaluates this solution. The sequence of the model is not linear, but there are possibilities of loops as some kinds of feedback between stages (Lawson 1997).

The main shortcoming of the model, as Ledewitz argues, is that it divides the design process into two unrelated stages, analysis and synthesis. This division creates a barrier between the two stages and leads students, in an educational context, to think that the creative leap will occur as a result of completion of the analysis stage. In addition, decomposing design problem into sub-problems in the stage of analysis results in losing the main problem's characteristics and identity, because ' sum of parts ≠ whole'.

Second Model: Conjecture - Analysis

This model is developed by Hillier et al (1972), and emerges as a response to the shortcomings of the preceding model. This model decomposes the design process into conjecture and analysis, or what Zeisel (1981) defines as imaging, presenting, and testing. The model emerges from the view of designer's mind as black box. The sequences of this model are that the designer imagines or conceives a solution in principle and develops it in more detail, then presents it in a form of drawing or study model. The presentation aims to elaborate the concept and communicate it, either with the designer himself or with others, in order to test and evaluate it. Therefore, the designer conjectures the solution, after that presents it for evaluation, and the cycle rolls over again until he/she reaches a suitable solution (Ledewitz 1985).

Jane Darke (1978) develops this model one step further and proposes one additional stage preceding the conjecture stage, the generator. For Darke (1978), the primary generator is considered as a departure point of the designer's design process, which determines how the designer tackles the design problem. The primary generator aspect will be discussed in more details in another section. Proposing the generator as the first stage derived from Darke's own experiment findings; in which designer in real practice utilizes related concepts or objectives, which direct the design process to specific direction (Darke 1978). Lawson (1997) explains this process as:

> *. . . first decide what you think might be an important aspect of the problem, develop a crude design on this basis and then examine it to see what else you discover about the problem.* (p 45)

4.3 Design Research Approaches

The two considerations of the designer's mind, either as black or glass box, have dominated the main stream of design research until the beginning of the eighties. Even though the nature of the design activities limited the design approaches to specific ones, researchers, as Lawson (1990) argues, invent different means and techniques to study and analyse the design action. These techniques are limited to:

1- Artificial experiment under controlled condition:

This approach represents a very respectable research method, but it is not able to reflect the real design action, and the experiment is not real design experience. In addition, the laboratory setting imposes artificial framework on the experiment, which results in the loses of the real essence of the design action (Lawson 1997).

2- Observing designer in action:

This research approach, while appearing to be realistic, cannot capture the whole story. The most important parts of the design process are hidden in the designer's mind, so observing the designer cannot actually reveal the complete picture (Arnheim 1993). The protocol analysis is considered as the popular research technique for such approach.

3- Asking designers about their design practice:

Interviewing designers in their workspace, or reading what they wrote about their design practices and processes could be considered as other ways to approach design discipline. The main problem for such approach is the level of confidence in what has been said or written. The designers may tend to "sell" their ideas, and stress some points to express their strengths and hide their weaknesses, so, they may fabricate a story (Lawson 1997). On the other hand, this approach may not be a useful technique because some designers may lack the ability to explicit their process correctly, and construct or rationalise their design process.

4- Thinking about design

At this research approach, the researcher builds an image of the design process he/she believes has occurred. The problem of such approach is that it proposes some thing that has not actually happened. The reason behind proposing this image is that the designer cannot explicit what they experienced in an accurate manner; therefore, the researcher tries to fabricate an image on the basis of what logically takes place. In general, this research approach does not a provide a clear picture of what designers really encounter and experience.

5- Trying to simulate the design process:

By this approach, the researcher tries to develop computer software to simulate the real design action. The artificial intelligent research is dominated by this approach.

In general, each one of these research approaches has advantages in clarifying some aspects, but at the same time, has shortcoming. As researchers, Lawson (1997) argues, we cannot stop thinking about design, but we have to continue to develop new approaches and methods of investigation to clarify the picture of the design activity. There are different methods on investigation that have been utilises by researcher to investigate the design process, such as "interviews, retrospective report, concurrent report, teaching, and introspection" (LIoyd 1995). All of these have some things to contribute to increase our understanding of the design process.

4.4 Paradigms for Describing Design

The previous section has outlined the possible research approaches for studying design activities; this section is devoted to presenting and explaining two main paradigms for describing design action. Dorst (1997) claims that in design research literature there are more than two paradigms, but the two most influential are:

- Design as rational problem solving process.
- Design as reflective practice.

These two paradigms are considered as a continuity of the two views about design, glass and black box, and present a wide range of research that was conducted in order to understand and analyse the design action as a means of

improving the design practice and the design products. Each one of these paradigms presents different research approaches; in my opinion the former refers to the view of the glass box, while the latter refers, generally speaking, to the view of the black box. The main similarity between the two is that both of them concentrate on studying the design process in the designer's mind while the designer conducts the design action.

To compare the two paradigms we will adapt Dorst's (1997) framework, in which he imposes a specific framework in comparing the two paradigms. This framework consists of four aspects, in which the paradigm tries to define or highlight their role:

- Designer.
- Design Task.
- Design Process.
- Design knowledge.

4.4.1 Design as Rational Problem Solving process

This paradigm was developed by Simon (1969), and emerged from the information-processing model of the cognitive theory (Eastman 1968). The information-processing theory aims to provide researcher with " an abstract symbolic medium within which we can represent, measure, and understand man's problem solving behaviour" (Akin 1986). The main characteristic of this paradigm is that it considers the design action as an act of problem solving in which the designer's focus during the design action is on searching for the appropriate solution among the vast maze of possibilities (Simon 1969). Dorst (1995) outlines this paradigm as follows:

> *Seeing design as a rational problem solving process, which means staying within the logic-positivistic framework of science, taking classical science like physics as the model for a science of design ... Logical analysis and contemplation of design are the main ways of producing knowledge about the design process... The problem solving approach means looking at design as a search process, in which the scope of the steps taken towards a solution is limited by the information processing capacity of the acting subject. The problem definition is supposed to be stable and defines the 'solution space' that has to be surveyed.* (p 262)

The rational problem-solving paradigm is a combination of three parts (Dorst 1997):

1- A practice-based phase model of the design process.
2- Considering designer as an information processor.
3- The nature of design problem.

From these components we can highlight the main aspect in design practice according to Dorst's framework (1997):

a- Designer: as an information processor.
b- Design Task (Problem): because the design problem is considered as an ill-defined problem, so the researcher has to find out how people reach an acceptable solution.
c- Design Process: a rational search process through problem space.
d- Design Knowledge: scientific way of choosing and handling the given information and data.

Researchers implement this paradigm in different formats, and invent different research approaches to study and analyse design action according to this paradigm. Some of these research approaches will be discussed in other sections.

4.4.2 Design as reflective practice

The rational problem-solving paradigm was not able to capture most aspects in the design practice (Dorst 1995), and cannot reflect what actually the designer has encountered and experienced (Schön 1983). Therefore, many researchers started arguing about how to overcome these shortcomings, and how to develop another paradigm that aims to reflect the actual design practice. The most influence figure among those researchers is Donald Schön. Schön develops his 'reflective practice theory' as a new paradigm to describe design action as it is experienced by practitioners (Dorst 1997).

Schön describes design action as a kind of conversation between designer and design situation, and the design task is a 'unique, universe of one'. This view of uniqueness stresses the nature of the design process, in which the designer is not looking for a standard solution or general role to utilize. According to Schön's

view, the designer could face an unexpected result from the situation, and the result requires immediate adaptation of the designer actions. Consequently, the designer considers each design action as a new one, and accepts the reality that the reactions and outcomes are not what is expected. According to Schön (1982), the practitioner tackles the new experience in two modes:

- Seeing as.
- Doing as.

As Schön (1982) argues "*Just he [the practitioner] sees the new problem as a variation on the old one, so his new problem-solving behaviour is a variation on the old*" (p 139).

Therefore, the mode of tackling the design problem cannot be generalized, and the researcher cannot describe it by any meaningful way (Dorst 1997). So, how to determine the appropriate approach for the design task is left to designer's artistic ability, which builds upon his/her professional experiences and knowledge. Based on that, the main task of a designer is to determine how to tackle each design problem in a unique manner. In addition, defining the design problem is left usually to the professional knowledge of the experience designer, so, there is no general role of thumb for defining design problem and setting its parameters. For Schön, design action is a kind of conversation between designer and design situation, in which the designer talks to the situation and makes some modifications, and the situation talks back to him, which, in response modifies his/her understanding: design behaviour. So, it is two ways of communication, and the designer modifies the situation and the situation responds to that, which results in increasing his/her understanding and in the end adjusting his/her behaviour. In general, Schön considers the design act as an act of learning.

In addition, Schön's paradigm builds upon the 'constructive learning theory' (Dorst 1997), described before, since the theory claims that the learners learn by accumulating their experiences and each new experience adapts the existing structure of knowledge. As Heylighen (1999) argues, "His [designer] interaction within and with the situation does not only shape it, but also makes himself part of it". In addition, the practitioner tries to shape the situation to his frame, but at the same time keeps it open to "the situation's back talk ".

To sum up this paradigm, we will utilize Dorst's framework (1997) by highlighting the main aspects in design practice according to Schön's paradigm:

a- Designer: the subject in this paradigm is not an information processor, but a person who actively deals with the design situation and constructs the design reality.

b- Design Task: for Schön, every design task is unique, which emphasises the nature of the design problem not only as ill defined, and holding some standard characteristics, but as a unique situation that needs specific attention and treatment; and furthermore, the general role cannot apply in any design situation. So, each design task needs specific tackling strategy, because the designer does not know what to expect, what to contribute, and what is the outcome(s); in addition, as much as the designer's understanding increases his/her reaction changes.

c- Design Process: this paradigm advises the designer to impose specific framework on the design practice, and considers it as a reflective conversation. This framework deconstructs the design action into four activities: naming, framing, moving, and reflecting.

d- Design Knowledge: the general principle for practising design is not applicable in this paradigm. The designer follows the model of "when to do what", in which the designer adapts his/her mode of thinking according to the situation, and is flexible in adapting and modifying his/her attitude. The professional knowledge becomes as a fuel for such action.

Valkenburg (2000) claims that the main argument of this view on design is "the idea that a designer subjectively interprets the design task and situation he is in". Based on this interpretation, the designer "reflects on the situation to construct a decision about what to do next". In general, this cycle of reflection-in-action "guides the progression of the design process".

The same author outlines the sequence of the design process as follows:

> *The reflective practice process can be seen as a cycle of activities, where the designers work by naming the relevant factors in the situation, framing a problem in a certain way, making (experimental) moves toward a solution and reflecting those moves.* (P 58)

Considering design act as reflective conversation between designer and design situation directs Schön to impose a specific framework on such conversation, and proposes generic description of the design process. This framework consists of four activities, and deconstructs the design practice into four stages, in which each stage represents a different moment of the design process and a different attitude of the designer.

1. Naming

At this stage, the designer names, or identifies, a number of characters that represent the main issues in the design problem. As Valkenburg argues (2000): "…the designer makes a choice for what he thinks matters in the design situation."

2. Framing

At this stage, the designer reverses, or twists, the character's need into architectural format. Frames, according to Valkenburg: "….are sense-making devices that establish the parameters of a problem".

3. Moving

At this stage, the designer conducts an experimental design action, or proposition, to test the frame(s). Valkenburg describes this activity as "…the actual designing takes place. The designer experiments to solve the design problem. Activities, like generating ideas, exploring problems, or looking at the consequences of design decisions, undertaken by the team, are called moves."

4. Reflection

This is the last step in this sequence. Here, the designer evaluates and criticizes not only the last move(s), but also the framing act that precedes it, which will determine the consequence step, either by constructing another move or by re-framing the design situation again. Schön (1983) states that

> ".. The designer evaluates his moves in a threefold way: in terms of the desirability of their consequences judged in categories drawn from the normative design domains, in terms of their conformity to or violation of implications set up by earlier moves, and in terms of his appreciation of the new problems or potentials they have created…" (p 63)

4.5 Some Aspects about Design

The preceding sections were devoted to explaining and presenting design research approaches and how each group of researchers tackles the design domain and studies it differently. In this section, we will discuss some aspects of design, which are not considered as research approaches, but could enhance our understanding of the design practice, and clarify some issues about the design action.

4.5.1 The Primary Generator

Jan Darkee (1978), in her interviews with well-known architects in UK about local authority housing and how they approach such complicated projects, has identified that there are sets of concepts and objectives that direct the design process from the beginning to specific direction, and act as primary generator for the design concept. These sets of concepts and visual images vary from one architect to another, and from one project to another. Darkee, argues for the conjecture-analysis design model as close description of the design process, which reflects what design actually encounters and experiences. At conjecture stage the designer imagines solutions in principle; this stage is followed by the stage of analysis to study this solution and develop it. Darkee claims that this stage has to be preceded by a stage of primary generator that is found to be " a useful way of conceptualizing particular stage in the design process. " (P 180) The primary generator consists of set of simple objectives or concepts that generate the solution (Darkee 1978). The same author has found, during her research, that in some cases a visual image comes very early in the design process, while in others a certain amount of preliminary analysis is carried out before such image emerges. Therefore, these set of concepts and objectives act as starting or departure points for the designer, or " a way to the problem" (Darkee 1978).

In general, the primary generator does not refer to the visual image of the building, but to the ideas that generate that visual image, because it sets the parameter for solving the problem (Cross 1982). In consequence, designers could drag their sets of primary generators from:

- Their prior experiences;

- Their social values and beliefs;
- Their design philosophy.

The importance of the primary generator comes from its ability to distinguish between the expert designer and the non-expert one, whereby the former accumulates a good amount of solution types or primary generators, which could help him/her at the beginning of the design process (Darkee 1978).

4.5.2 Designerly Ways of Doing and Knowing

Each discipline creates its own mode of thinking and acting, which reflects the type of problems it deals with, and solutions produced. Lawson (1980), in his study of design behaviour, conducted an experiment to investigate the difference between architectural and scientific students in dealing with a design-like problem. He found that each group utilized a distinctive approach; while science students used a problem-focus approach, architectural students utilized a solution-focus approach.

Cross (1982), argues that:

> *The scientists generally adopted a strategy of systematically exploring the possible combination . . ., in order to discover the fundamental rule, which allows a permissible combination. The architects were more inclined to propose a series of solutions, and to have these solutions eliminated, until they found the acceptable one.* (p 223)

This type of behaviour depends on the educational system of the two professions. Architects usually learn that there is no specific and defined answer for any design problem; in addition, there are no correct or wrong answers but better solutions, whereby one solution concentrates on one aspect while the others concentrate on other aspects. Therefore, the designerly way of doing stresses proposing a solution and evaluating it, as a way towards understanding the design problem. In contrast, scientists are used to investigating and understanding the problem in order to discover its structure before proposing any solution. The problem-focus approach encourages students to search for the correct answer, which has to come after the understanding of the problem. As Lawson (1980) comments:

> *The essential difference between these two strategies is that while the scientists focused their attention on discovering the rule, the architects were obsessed with achieving the desired result . . . [architects] learn about the nature of the problem largely as result of trying out solutions, whereas the scientists set out specifically to study the problem.* (p 32)

In general, the difference of strategy between the two groups, Lawson argues, does not reflect the personal differences, but reflects the affect of the educational system on the students, and how each discipline formulates and modifies the students' mode of thinking.

This conclusion creates the base for the second aspect, the designerly way of knowing, (Cross 1982). The same author claims that the designer has his/her own distinctive:

- Things to know;
- Way of knowing them; and
- Way of finding out about them.

These specific characteristics explain how designer inquires about new things, beside his/her way of doing. Design problems have unique character, as Levin (1966) claims, in which the solution of the problem does not exist in the data provided, but the designer has to add some ingredients, which could allow a solution to emerge. Therefore, the designer's job is not to combine and merge different parts to generate the solution, but to actively construct the solution (Cross 1982). Cross further identifies five characteristics that distinguish designerly ways of knowing from others:

1- Designer deals with ill-defined problem, which differs from the one of the scientist and the scholar.

2- Designer utilizes solution-focus in solving design problem.

3- Designer mode of thinking is constructive.

4- Designer manipulates the abstract requirements into concrete objects by utilizing 'codes'.

5- His/Her code is used to both read and write in object languages.

4.5.3 Parallel Lines of Thought

The importance of the parallel lines of thought comes from the ability to explain some moment of the cognitive process in the designer mind. For many designers, as Lawson (1993) argues, different lines of thought occur at the same time as a reflection of the designer action to solve different, but related, aspects in the design problem. These aspects, as in Lawson's example, could be arrangement of spaces in plan to accommodate large number of visitors, with treatment of the elevation in order to produce a coherent new elevation that could fit with the existing one. The existence of the parallel lines of thought could be identified in the project's sketches with the interpretation of the designer. In addition to that, the parallel lines of thought represent the complex nature of the sketches, because during the design process the designer may have several lines of thoughts operating in parallel at the same time. As observers, we do not have any clear idea of the design sequence, and which decision preceded or was affected (Lawson 1993).

4.6 Conclusion

The section is considered as the main contributor in increasing our understanding about the mysterious nature of design process. Studying the design action from different perspectives ended up with adapting Schön's paradigm in describing the design action as the research paradigm, and his framework as the ALT's framework in deconstructing the design action. This framework could be utilised by students in their presentation activities in order to improve their understanding about the design practice.

5 Professional Knowledge

5.1 Introduction

The reflective practice theory by Schön (1983) describes design action as reflective conversation between designer and design situation. This conversation modifies the designers' understanding of the situation, which results in modifying their actions to respond to the talk-back of the design situation (Heylighen 1999). This description emphasises the active role of the designer in dealing with the design problem and with the new information provided. For Schön (1983), the designer's professional knowledge and experiences are considered as the driving force or the sustainable fuel of this active integration between designer and design situation; this force directs the designers and guides them during the design practice. This type of relationship between architect and design situation is a 'constructive' in which each side is affected and modified by the other. As stated by architect Fumihiko Maki when he explains the design process (Suckle 1980)

> *This is the architect's conversation: a communication between his or her inner landscape and specific conditions of a part of the world's landscape in time. Each project the architect undertakes is a conversation among the unique situation, the ever-increasing range of material and technical resources available, and the architect's ability to draw on the whole of these resources, which, among other things, include much of the world's inherited knowledge, traditions, racial culture, and philosophies* (p 80)

5.2 Professional Knowledge Categories

In order to understand the nature of the professional knowledge and its categories, we need to highlight some of its aspects, and how students acquire and store it.

5.2.1 Types of knowledge

Heylighen (1999) argues that professional knowledge could be divided into two types based on its relationship with the knower and how he/she reacts in the action of acquisition.

A. Tacit knowledge

This type of knowledge is integrated with the knower, and its acquisition takes place during active experience. At this active experience the knower has to integrate his/her personal knowledge with the new one in order to own it and make it personal entities. Acquiring this type of knowledge has impact on the learner's or knower's knowledge which then undergoes some modification. In general, this type of knowledge and "its acquisition tends to be staggered over time and rooted in experience" (Heylighen 1999). Another researcher calls it "practical knowledge" (Eraut 94). As result of that, the tacit knowledge is embedded in the learner and could not migrate from one learner to another. The acquisition of this type requires the learner to be active and involved in the acquisition activities in a constructive mode, and to be an integrated actor (Heylighen 1999).

B. Explicit knowledge

This type of knowledge is at the opposite end of the other in that its nature does not require such deep relation with the knower. Its nature is like academic and theoretical knowledge, which could be acquired without any modifications of the learner's personal knowledge. As consequence, it could migrate from one learner to another, and learner could be a passive actor during the acquisition activity (Heylighen 1999). Eraut (1994) calls this type of knowledge a "technical knowledge".

5.2.2 Types of memory

Investigating the nature of the knowledge and how knower reacts during the acquisition process lays the ground for investigating how the knower stores this knowledge and what different types of memory have been used. According to Tulving (1983) there are two types of memory episodic and semantic:

A. Episodic memory

This type of memory deals mainly with "unique, concrete, and personal experience that dated in rememberer's past" (Tulving 1983). Another researcher called it "experiential", in the sense that it deals with the tacit knowledge, which is embedded in the learner's personal knowledge, and any part of this memory has a meaning (Lawson 2001). In general, this type of memory is used during practical actions, and designing action is one of them. For Tulving (1972)

"episodic memory refers to memory for the professional experience and their temporal relation" (p. 402).

B. Semantic memory

This type of memory refers to "a person's abstract, timeless knowledge of the world that he shares with others" (Tulving 1983). For Lawson (2001) this type of memory is "theoretical" and deals with the explicit knowledge, in which the nature of knowledge is abstract and scientific, and the learner deals with it in a passive mode. For Tulving (1972), semantic memory "refers to system of receiving, retaining, and transmission information about meaning of words, concepts, and clarification of concepts" (p. 402).

In general, there is a relationship between knowledge types and how learner stores them; if learner is active participant in the acquisition activity, and the type of knowledge requires this kind of reaction, then the episodic memory is in operation. Whereas if the new knowledge is abstract in its nature, the learner reacts in a passive mode and remembers it as abstract entity and does not interact with it.

5.3 Architect's Professional Knowledge

In during the course of his/her school years and professional practice each practitioner creates and develops a "reservoir of knowledge" (Lawson 1980), in which the professional knowledge is accommodated by its categories. Each type of the professional knowledge has significant role in building the designer character, in which the experiential knowledge creates the designer sense, and allows him/her to decide what to do next (Suckle 1980); on the other hand, the theoretical knowledge allows him/her to do the design task in professional manner. Creating architect's sense distinguishes one architect from another, and allows them to deal with the design problem data architecturally (Ledewitz 1985). As architect John Johanson puts it (Suckle 1980)

> *Many architects are intuitive rather than rational; they don't deal entirely in established or proven fact, but from some 'sense' of how things are or might be. Although increasingly our profession draws on people with special knowledge, it still deals not with just the scientific,*

> *actual, literal truth, but with poetic truth, with concepts, ideas,*[and] *expressiveness.* (p. *68*)

This reservoir becomes as a library of examples, concepts, and technical data that could be utilized and consulted during any design practice. Schön (1983) explains the process of creating such reservoir of knowledge for practitioners and calls it "repertoire", which may apply to students in our case as follows:

> *The practitioner has built up a "repertoire" of examples, images, understandings, and action. [his/her] repertoire ranges across the design domains. It includes sites he has seen, buildings he has known, design problems he has encountered, and solutions he has devised for them.* (p. 138)

Therefore, this reservoir of knowledge, or in Schön's term "repertoire", contains a wide range of professional knowledge, information, and technical data that have been accumulated over years of practice. Lawson (1990) summarizes the importance of repertoire as:

> *The ability to initiate or express ideas, ... , [which] depends on having a reservoir of knowledge from which to draw these ideas. (p. 160)*

The contents of this reservoir vary from one architect to another, and depend on their involvements and participations in prior design activities, in addition to the building type they deal with. So, if the architect works in a firm that deals with housing projects we could expect most of the designer's reservoir of knowledge to be about, and related to, this type of building.

As for architectural students, they could improve and develop their reservoir of knowledge by exposing themselves to other designers' practices and experiences, and initiating a design discussion with design tutor and other students in order to improve their reservoir and expand their frame of reference. Hertzberger (1991) supports this argument by conveying a similar message to the students of architecture when he declares:

> *Everything that is absorbed and registered in your mind adds to the collection of ideas stored in the memory: a sort of library that you can consult whenever a problem arises. So, essentially the more you have seen, experienced and absorbed, the more points of reference you will*

> *have to help you decide which direction to take: your frame of reference expands.* (p. 5)

Therefore, the repertoire or reservoir of knowledge, not only allows students to practise design professionally, but provides them also with concepts that could enhance their ability to solve the design problems, or at least to approach the design problems professionally; furthermore, it could provide students with the vocabularies they may need during their design discussions and presentations.

In addition to its role in enhancing the design practice the importance of the reservoir of knowledge and of building it up is highlighted by architect and educator Herman Hertzberger, when he explains (Suckle 1980):

> *When we are designing, we have to explore our memory continuously for all the experiences that can be brought to bear on what we are making. What we create can be different from, but never more than, what has become part of ourselves as experience. By referring each one back to its fundamentally unchangeable ingredients, we then try to discover what our images have in common and find thus the cross section of the collection, the unchangeable, underlying element of all the generating point.* (p. 52)

In consequence, there is here an implication on architectural education, that is, the educational system has to encourage students to build and improve their reservoir of knowledge, and the introduction of this practice must focalise the design educator's attention.

5.4 Precedent and its Role in Design Process

The reservoir of knowledge consists of different types of information, images, design concepts, technical data, and other elements that could be utilised during design action. The most influential element is the "precedent". The precedent can be defined as: a mental image of a design element, as conceptual idea, an architectural form, or some other abstract form which was created either by designer or by others in order to solve a design problem. Therefore, the precedent could contain a mixture of mental images of buildings, projects, either as a whole or in part, and some specific element that represents an aspect in design problem. Besides, it may consist of abstract objects, or icons, as a

representation of some specific experiences or places. This (2001: 4) when he says: tentative definition could be supported by Lawson

> *Precedents are usually either whole or partial pieces of designs that the designer is aware of. They may be previously employed solution by same designer, by famous designers, buildings, landscape or towns seen on study visits or even on holiday. . . . perhaps the furniture, clothes or possessions of characters in films may be used.*

This element of designer's repertoire is called "reference" by Goldschmidt (1998). She argues that 'reference' is more appropriate than 'precedent', because reference could contain additional elements and cover larger portion of them. She claims that:

> *" . . precedents are extracted from the oeuvres of the most famous, most published, most admired architects of the present and the recent past." (p. 261)*

So, for her the reference is more general and suitable to include various elements more than the precedent. In response, we could expand our vision about the nature of the precedent to fulfil the condition of the 'reference' and retain the name as 'precedent'.

In so doing, precedent is made to cover a wide spectrum of mental images that could inspire designer during the design process. So, the precedent could be divided into two parts:

- Within domain, that includes all architectural elements.
- Between domains that includes all non-architectural elements. (Goldschmidt 1998)

The precedent, as part of the reservoir of knowledge, has also a crucial implication on architectural education, in which establishing a position for creating and developing a "student's precedents library" in the architectural education is essential, for it could allow students to improve their design practice, and to benefit the most from others' design experiences and professional knowledge. As Lawson (2001) argues:

> *Precedent is such a vital, central and crucial feature of the design process that plays a central role in all design education. One of the key*

> *objectives of design education is to expose young students to a veritable barrage of images and experiences upon which they can draw later for precedent.* (p. 3)

In general, the precedent does not refer to the mental image of the design concept that emerges in the beginning of the design process (Darkee 1979), but to the mental image of other projects or objects that enhance the designer's ability to conceptualise the design solution, and provide him with a ready-made concept ready to be adopted, either partially or as whole. These mental images crop up during the design process at various stages to provide students with different formats of enhancements and inspirations to tackle the design problem in professional manner. So, this library allows students to borrow different design ideas from others and to utilise them in their design practice.

5.5 Conclusion

This section is devoted to investigating the nature of the professional knowledge and how students could improve and develop theirs. As the professional knowledge is the sustainable fuel for the design practice, its categories and mode of storage have been investigated also. In addition, the architects' professional knowledge and the ways they could improve their reservoir of knowledge are also investigated. This investigation concluded with the importance of building "student's precedent library", in which students could store and organise their precedents in an easy accessible format for them during the design practice.

6 Architectural Education

6.1 Introduction

The preceding sections in this chapter explained and highlighted different aspects related to the subject of the research, architectural education. This section, as the last one, is devoted to the explanation and exploration of the nature of architectural design within the context of architectural education, and also of the medium of teaching/learning design, the design studio.

Architectural Education is understood to be "*active, iterative, project-based. It is developed through close relationship between students and studio's tutor, often on one to one basis*" (Fisher 2000: p 05). This type of environment is considered by the educational modern theorists as " learner-centred" (Fisher 2000). The learner-centred approach considers students as active participants during the learning processes, in which they have to be active in devoting or proposing new knowledge, and adding it to the provided information in order to solve the design problem.

Design studio, as the core of the architectural education's curriculum (Bunch 1993) and as the backbone of architectural education, is a learning environment which could be described as an active and interactive learning setting, and an environment for "learning by doing"(Schön 1983) which creates the possibility of an interactive relationship between student and studio tutor(s). The design studio has attracted researchers' attention for many years (Salama 1995, Anthony 1991, Dorst 1995). This environment is considered as a "melting pot" for architectural education, in which many disciplines related to architecture are integrated, such as building technology, social science, engineering, professional practice, management, and others. Ledewitz (1985) argues that, in architectural design studio, the student learns three basic concepts:

1. Learn and practice a new skill as visualization and representation.
2. Learn new language: learn how to express and explain ideas through sketches.
3. Learn to "think architecturally".

In addition to that, Nicol et al (2000) point out that the design studio is the environment in which the student:

1. Acquires design and professional knowledge;
2. Develops design skills;
3. Explores appropriate professional, social and cultural attitudes.

The richness and the complexity of the studio's environment have encouraged researchers to study and investigate this environment in order to improve the studio's practice, and to respond to urgent requests from the professional practice and society (Nicol 2000). Research has varied from studying the studio's assessment system, juries, (Anthony 1991 and Doidge 2000), to developing new design teaching methods to fulfil new social requirements (Salama 1995) and, last but not least, to responding to the emergence of new practices in the profession (Nicol 2000).

6.2 Architectural Design Studies

This section sets out to present the current design research in architectural design. Most of the design research mentioned before concentrated on designs in general, either industrial, graphic, and engineering design, or other types of design. Architectural design has some specific characteristics that distinguish it from other types of design; and also since this research is undertaken from the architectural standpoint, we will discuss and explain various research studies conducted to analyse and study architectural design.

The research is divided into three categories based on the period on which the research concentrates, either before, during, or after the design action. This division reflects some of the cognitive scientist's perspectives in approaching any creative act (Runco 1994), in which he concentrates on the environment of the creative process, the creative process itself, and the creative products.

6.2.1 Design Practice Environment

The main concern of researchers interested in the environment of the design practice is to create the appropriate environment for designer inside design studio, to practice design professionally, and in addition, to build students' awareness of some aspects related to the architectural design domain. As there is a wide range of research done in this domain, we will concentrate on some examples that represent the main approaches. The three main research approaches that have been chosen cover different aspects related to the

environment of the design studio. The first research, compiled by Nicol and Pilling (2000), aims to introduce different aspects related to the changes that have emerged in the professional practice of design, and architectural education, such as: communication with other parties like users and clients, team working, and design as lifelong learning process. The second research, which was conducted by Ashraf Salama (1995), aims to introduce behavioural aspects in the design studio practice and calls for an integration of behavioural aspects, in addition to building the students' awareness of such aspects.

The third research is done to develop the assessment tool of the design practice, crit or jury. Anthony (1991) and Doidge *et al* (2000) aim to revise the jury system, and allow students to utilise it as a learning tool and to benefit from this opportunity, not only to asses their design product, but to develop their design practice and process as well. Their investigations concluded with various suggestions for students to make the most from the crit.

According to Anthony's investigations, there were different opinions about the objective of the crit ranging from the design tutor's, students', to practitioners points of view: (Anthony 1991)

A- For design tutor, the design crit is about:

1- Increasing students' understanding about design practice.
2- Ending the process of designing, and allowing students to present their story in graphic and verbal medium.
3- Providing students with the opportunity to present and communicate the design process and solution to others and to receive a feedback allowing them to take the design problem further.
4- Assessing students' work.
5- Expanding students' awareness about architectural discourse.
6- Preparing students to the real practice.

B. For students, design crit is about:

1- A learning tool for discussing and investigating their design practice.
2- Assessing their work, but according to the design brief, and what they stated as objectives or aims only, rather than what juries believe.

3- Learning how to present the design work and process in oral or graphic format.
4- Two types of crit have to be distinguished:
   - Final crit, for marking the end products.
   - Intermediate crit, for improving communication skills.
5. Learning how to express one's ideas verbally and graphically.
6. Discussing the project.

C. For practitioners, the design crit is about:

1- Learning.
2- Preparing students for real practice.

In general, as highlighted by Lewis (1985: 77), the crit is important because:

> *" . . it [crit] simulates to some extent the reality of making presentations in practice; it reinforces the importance of meeting deadlines; it provides a forum for students to see each other's work and for faculty to see the work of students other than their own; it encourages graphic quality; and through jury discussion, it raises important issues and promotes new thinking.*

In addition to assessing the current crit and jury system, Anthony (1991) and Doidge *et al* (2000) proposed different crit formats in order to improve the condition, and allow students to utilise the crit as learning tool.

6.2.2 The Design Process

The research group that focuses in design process sets out to investigate the cognitive process of the design action, and tries to understand the action as it occurs in designer's mind. Most of the research approaches mentioned in the beginning of the chapter are considered as belonging in this group. To our knowledge, there is no specific design research done specifically for architectural design, but the subjects of this type of research are designers from different disciplines of design such as architects, industrial designers and others.

6.2.3 The Design Product

The group of researchers that come under this umbrella concentrate on the end product as a means to understanding the design process, and aim to rationalise the design decision process. The researchers vary in their areas of interest, and each one approaches the analysis of the end product from a different perspective, such as: form analysis, typology analysis, individual style, and others.

6.2.3.1 Form Analysis

Researchers who concentrate on form analysis develop techniques and guidelines to analyse the building form as a means to understanding how designer developed his/her project concept, and rationalised the design decisions. This technique is useful for teaching purposes, whereby students could fully analyse the project and extract the main points in the project either as abstract form components or in terms of how designer reacts to the external constraints, like site for example (Baker 1996).

6.2.3.2 Typology Analysis

Building type and typology is another technique for studying design process from the perspective of the end product. Laseau (1991) develops a technique to analyse the works of F. L. Wright from the typological point of view, and the way some specific projects and buildings hold similar characters.

6.2.3.3 Individual style

This approach, similar to the previous one, is one in which Chane (1992) tries to analyse the residential buildings of F. L. Wright and to extract the main elements as a means to identifying the architect's personal style in approaching similar projects in addition to his (architect's) treatment of different projects from one category in similar manner.

6.2.3.4 Analysing architecture by proposing Filters

Unwin (1997) proposes specific filters to analyse building form, and to allow students to understand the complexity of these buildings by segregating their elements according to the determined filters, or frame of reference. Each one of

these filters "*abstract a particular aspect of the complexity of architecture: architecture as making frames, primitive place types, temples and cottages, stratification, geometry*" (P- 10).

6.2.3.5 Analysing architecture by precedents

With the technique of analysing architecture by precedents Clark and Pause (1996) introduce the idea of precedents. The precedent idea tries to assimilate the analysed project with a well-known project. The authors argue that many buildings have some similarity to other buildings and nothing is completely unique and new. The precedent technique does not concentrate on the building as a whole, but as elements. The technique analyses the building according to specific issues such as: structure, circulation, nature light, masses, geometry, and system and balance. All of these categories make up the vocabulary in analysing building form.

6.3 Architectural Design Teaching Models

After presenting some aspects related to Architecture domain and the research work that has been conducted to investigate the design practice at different stages, this section is devoted to highlighting how architectural design has been taught, and how design tutor creates and develops the studio environment for students to benefit the most and practice design professionally.

In his book "*New Trend in Architectural Design: designing the design studio*" Ashraf Salama (1995) presents ten teaching models of Architectural Design in order to develop a new teaching model to respond to the emerging needs in the professional practice. In fact the teaching models are more than that, as each design tutor is trying to develop his/her own model. However, the author aims to present the most theoretically based models. For this research work and in order to expand our vision about design studio practice, each model will be presented briefly, and the main pedagogical aspects mentioned, but the main focuse is the teaching style, and how design tutor realises his/her theoretical knowledge in studio practice.

The presentation of these models will be according to a proposed framework that consists of three parts:

1- The aim and objective of the model.

2- The mechanism for achieving this objective.

3- The implication(s) for design studio practice.

6.3.1 The Case Problem (Experimental) Model

This model has been originally put forward by Martin Symes and Alixi Marmot (1985), and it aims to encourage students to be active in their design practice, particularly in the process of decision-making. The model is based on the use of a real design problem, in which it is described up to the point where the design decision has to be taken. Therefore, the student are placed in this position in order to force them to be active and experience the reality of the professional practice.

For this aim to be achieved, the design process is divided into three stages: at the first stage, the student has to generate a variety of possible design approaches, which build upon an extensive reading for their theoretical base. After that, the students have to evaluate them according to several aspects such as: spatial organizational, semantic rating, environmental aspects such as: natural light, wind pattern, and noise control, in addition to construction resources and economic analysis. In the third stage, and after completion of the evaluation stage, students have to revise their design intentions and present revised approaches to solve the whole problem (Salama 1995).

This division of the design process has implications for students' design practice, in the course of which he develops an initial idea based on precedent; then, based on suggested readings, he has to test this concept before finally revising it, or proposing another design approach (Salama 1995).

6.3.2 The Analogical Model

This model is developed by Gordon Simmon (1978), who claims that the design process is not invention, but a process of selection in which generating the design concept cannot be from nothing, but from a combination of other ideas. Therefore, the main role of architect is to combine different parts and parcels to produce the final idea, and get inspiration from other disciplines. In general, this model tries to explore the relationship between gathering information and occurrence of formal ideas (Salama 1995).

The model is divided into two sub-models:

A. The building technology model: In this model the student chooses and analyses a set of technical/structural elements of an existing building with the intention of manipulating and integrating them with his/her design solutions.
B. The formal vocabulary model: In this model, students work in the manner of a famous architect, which includes the model architect's mode of communication and how he/she tackles the design problem. This process is preceded by a stage of analysis of the works of the selected role model (Salama 1995).

Therefore, the teaching style encourages students to integrate and analyse the data with the design process, and to identify the value of the data in hand.

6.3.3 The Participatory Model (Community Design)

This model has been developed by Henry Sanoff (1979), and calls for direct involvement of clients and users in the design process. By using real clients, real users, and real projects, the author is aiming to allow students to experience the real life of the profession (Salama 1995).

This model consists of four main stages: awareness, perception, decision-making, and implementation. The first two which are interrelated, involve the student in the literature review of the design's topics, then with a meeting with the clients and users to get their feedbacks. After that, the third stage, the decision-making stage, commences with student developing an abstract design concept, and discussing it with the clients and users. The role of the students in developing the schema is that of a facilitator, in that he/she helps the participants to reach a decision about the scheme. The final stage comes in when the participants reach an agreement about the scheme, paving the way for students to implement their decisions on the final design scheme (Salama 1995).

6.3.4 The Hidden Curriculum Model

This model is developed by Tomas Dutton (1987) and considers design as a process of acquiring knowledge under certain conditions. It is based on the concept of the "Hidden Curriculum" which refers to un-stated values and attitudes embedded in the student's social life and culture. Students' values and

attitude have to be integrated in the design process, from the formulation their own programme to the design solution (Salama 1995).

The design process in the studio is divided into three stages. The first one commences by allowing students to explicit their values about the urban life, then to develop their programmes before determining the social context of the project. Therefore they, choose the site from a pre-selected set. The second step exposes students to the design decision making process which could lead them to overtaking the responsibility of running the project, in which the design tutor acts as facilitator. The last step is the evaluation, which has to be explicit and makes students share their own with others. The main aspect of this model is that it calls for a student-centred setting in which the design tutor is a facilitator and the proposed knowledge and values questionable whatever the sources are (Salama 1995).

6.3.5 The Pattern Language Model

This model has been developed by Haward Davis (1983), and is based on the "Pattern Language" of Christopher Alexander (1977). The design process is considered as a set of procedures in which the functional and the formal rules of the built environment come out from the application of the individual building rules and collective actions. The patterns are considered as specific physical relationships that "accommodate a recurrent human situation" (Salama 1995). Therefore, students have to understand these rules before utilising them in their design practice. Through this utilization, students could investigate the social mechanisms that are transmitted with these rules, and how to determine new rules for different situations (Salama 1995).

In the beginning of the project, the tutor introduces the pattern language to the students as a means of helping them to organize their design process, and as a source of information about formal/functional relationship in the environment. So the pattern language serves as facilitator and guidance through the design process (Salama 1995).

The process of teaching/learning is divided into different steps, and students split into groups. The process starts with extensive group discussions about the programme, and the characteristics of the site. With the second step, students define their design intentions in the form of pattern language, and discuss them

with other groups. The third step aims to examine the proposal patterns and concludes with the final site plan. The fourth step, the final one, consists of different interactive processes as building design in which students investigate existent and simulated buildings and review the rules in order to propose a design solution, and present it to others (Salama 1995).

6.3.6 The Concept Test Model:

This model is developed by Stefani Ledewitz (1985), and contradicts the traditional design-thinking model, analysis/synthesis, and proposes another model, the concept-test model. This model considers the design as a conjecture/testing or what Zeisel called "imaging, presenting, and testing" (Zeisel 1981).

At the conjecture stage, the early stage of the design process, the designer conceives a "solution in principle", which progressively develops and gets refined during the subsequent stages (Ledewitz 1985). This model conceives design activity as a cycle of actions between generating ideas and presenting them for assessment, and refining them again while students acquired the required knowledge when they identify the need for it (Figure 04). So the cycle keeps running until it reaches an acceptable end. In addition to that, it enables the designers to learn from their works and acquire the skill of self assessment (Salama 1995).

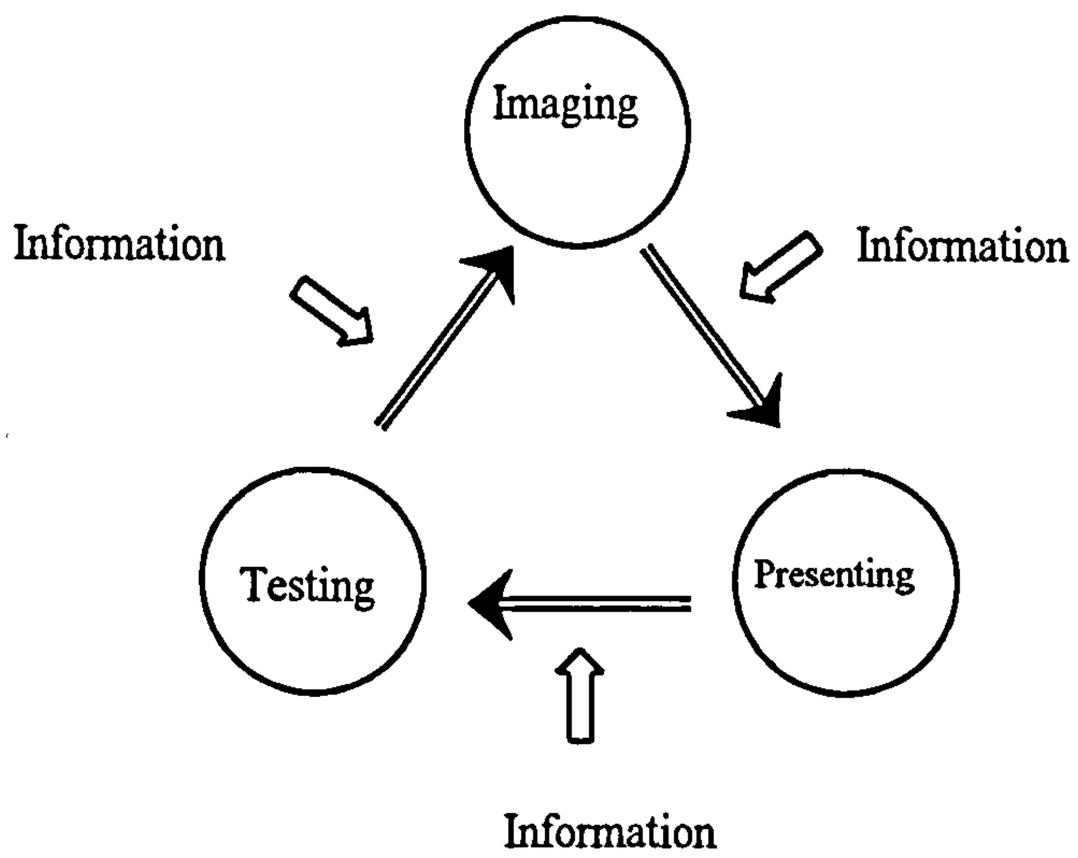

Figure-4: The Concept-Test Model

To realise this model, the studio project is subdivided into a series of design actions, in which each action ends with a solution for the whole project. Usually the first stage is short, and produces a very schematic proposal, but it is followed by different stages, the number of which depends on the type of the project. The stages get progressively longer and the proposed solution is improved until it reaches the acceptable solution.

There are different characteristics and pedagogical issues raised by this model, that is:

1. Student starts the design action directly by proposing a design concept that represents the student's ultimate understanding of the design problem at that time.
2. Student tackles the design problem as a whole without decomposing it into parts and tackling each one separately, which differentiates the conjecture/testing model from the analysis/synthesis model.
3. Design action is multi-cycle actions; in each cycle the students improves their design concept and develop it more than in the previous cycle.
4. The information of the design task is given to the students in incremental packages to allow them to distinguish the relevant from irrelevant information to the design situation (Salama 1995).

6.3.7 The Double Layered Model

This model has been developed by Gabriella Goldschmidt (1983), and conceives architectural design as it happens in the overlap zone between two processes: the creative process and the problem solving process. It is based upon the fact that acquiring knowledge is the most important factor in the learning/teaching process of design. To realise this idea the model has four stages (Salama 1995):

1. Information gathering.
2. Personalising this information by interpreting it according to designer's priorities.
3. The designer's input, based in tacit knowledge.
4. Proposing design solution and presenting it either by drawing or studying models.

This sequence of stages which starts with gathering information and ends with proposing the design solution emphasises the importance of acquiring the

knowledge and manipulating it over and over, and then presenting the final solution as it images from the designer's personal experiences (Salama 1995).

6.3.8 The Energy Conscious Model

This model is developed by Raymond Cole (1980) and concentrates on raising the issue of energy, and how students could integrate this issue in the design process from the early phase of the design concept.

The mechanism operates by providing students with a comprehensive information about the energy that reflects the stage the designer is in, which could allow him to manipulate it in the design process. Therefore, the model enhances students' ability to transfer theory to practice, and encourages students and tutor to identify the suitable time for introducing new knowledge, and from which type (Salama 1995).

6.3.9 The Exploratory Model

Julia Robinson and Stephen Weeks (1983) developed the model, which aims to develop students' understanding of the information related to design problem while they develop the solution(s). The format of the teaching/learning is not like other models of design studio, but is seminar-base classes that support students in their design studio. The authors argue that

> *design is not analysis versus synthesis, nor rational thought versus intuitive thought, but one of programming as verbal and numerical exploration, and design as form exploration.* (Salama 1995: p 122)

The mechanism of implementing this idea in design studio is realising by dividing the design process into eight exercises organized within a sequence moving from organising the ideas and hypothesis to specific issues. These exercises start with studying precedents that bear similarity with the project in hand, and then concentrate on the standards that govern procedures and social expectation about how building should perform. After that, the following exercise explores the problem by utilising the analogy in problem exploration. The next exercise concentrates on examining the spaces that have historically been designed. The final exercise concentrates on testing the new design

directives and major programmatic issues that generate boundaries for the testing activities.

In general, the model encourages students to be involved in "exploring and testing the alternatives, understanding and transforming precedents, and adapting information into final product" (Salama 1995: p. 123)

6.3.10 The Interactional Model

This model is developed by Mark Gerlenter (1988). It does not consider the design-thinking model as an analysis/synthesis, but rather as a conjecture/analysis one. This model is similar to the concept-test model by Ledewitz. It stresses the starting point of any design idea, the cognitive scheme, which emerges from the designer's repertoire of design ideas who then imposes it on the design problem to test its ability to satisfy the design requirements. So, the conjecture process starts with generating a mental image based on the prior experiences and evaluates it based on rational scientific thinking, which may end up by identifying the need for acquiring additional information to modify the initial ideas, before testing them again (Salama 1995).

The main idea of this model is that, students commence their design process by utilising their own design experience and repertoire to solve the design problem, and if they could not, they have to look for another source of inspiration and knowledge that could help them to solve the problem. From the beginning of the design process, knowledge has to be provided to students for them to assimilate it as the process gets complex (Salama 1995).

6.3.11 Discussion of the models

The ten models cover a wide range of aspects that relate to developing the teaching/learning process in the design studio, so these discussion has to be directed toward that aspect. (Salama 1995)

The concept test, double layers, and interactional models adapt the thinking model conjecture/analysis mode as design model. At the conjecture stage students generate design concept depending on the existing cognitive schemata and the uses of extra rational artistic procedure. That stage is followed by the analysis stage in which the concept is tested and evaluated. The case problem model, the participant model, and the pattern language model, are all driven

toward preparing students for the professional life. The participant model may vary by concentrating on the sociobehavioral issues; in addition the pattern language model concentrates on investigating the social mechanisms. The hidden curriculum is driven by critical philosophy and aims to examine the ideologies of different groups and cultures.

The exploratory model is similar to the first group by combining the stage of analysis with synthesis, and it involves students in different exercises to investigate different issues. This model differs from all other models in that it does not require students to produce a design solution, because its format is seminar classes that aims to support students' studio practice.

The last group, the analogical and energy conscious models are similar in nature. Here the relationship between knowledge and idea generation is the major concern, with the energy-conscious model concentrating on introducing the energy data at the conceptual stage.

The first line of distinction is about the theoretical background, but the following one will bear on the teaching process. All models concentrate on laying the responsibility of the learning on students' shoulders, which in fact distinguishes them from the traditional studio; they also encourage students to work in a group as reflection of the nature of the professional practice. Each model differs in the set-up of the group work, while some encourage students to work in group from the beginning of the design process, others allow students to share their thoughts with others at the data collection, or at the discussion stages (Salama 1995).

6.4 Aspects about architectural Design

There are different aspects related to architectural education that present researchers' efforts in integrating and introducing new issues to the architectural education domain. Some of these issues have a similarity to the one mentioned before but they were developed especially for architectural students. These issues include replication techniques, reflection techniques, design action recording techniques, and design media.

6.4.1 Replication Techniques

The replication technique was introduced as research method to explicit the design process, and was invented by William Porter (1988). The replication technique was developed farther by Per Galle and Laszlo Kovacs (1996). The final format of this technique aims to draw the line of thoughts that may have happened during the design process. The replication technique is similar to the famous research technique called "protocol analysis", which aims to externalise and explicit the design process, and instruct designer to "think loud" and explain the design process. The replication technique differs from it, for the protocol is not done by the designer but by a replicator who is familiar with architectural design. This distinction aimed to overcome the major problem of the protocol analysis regarding the level of confidence in the protocol.

In general, the replication protocol consists of a written protocol of what the replicator believes occurred, and the train of thoughts that might have happened (Gale 1996). In addition to that, the replication protocol consists of two steps; at the first one the replicator studies carefully a given design brief and a given solution. After completing this stage, he/she tries to replicate the line of reasoning he/she thinks might have led designer from the brief to the solution, but without communicating with the real designer (Gale 1996).

6.4.2 Reflection Techniques

The experiential learning theory emphasises the role of reflection action in learning situation; and the reflective practice theory considers design practice as reflective conversation between designer and design situation. All of these theories stress the importance of introducing this action in the design studio practice. Such act could allow students to benefit greatly from their prior design experiences, and bridge the gap between several studio projects during the school years. In addition to that, it widens the student's vision of design practice inside design studio.

Maura Quayle, in her article "*Technique for Encouraging Reflection in Design*" (1989), lists several reflection techniques in design studio. The author, in presenting these techniques, was calling for "an Informed Reflection" which attempts to encourage post-project learning (Quayle 1989). The author argues that in design studio there is a gap between the latest project and the new one,

and this gap not only segregates the studio projects, which implies that the old project does not have any noticeable effect on the new one, but it neither allows the teacher to asses if the students benefit from their previous projects or not. Therefore, the author proposes different techniques that could encourage students to reflect on their design experiences, and allow teacher to measure not only the benefit of the different projects in one design studio but also the improvement of the students design skills (Quayle 1989). In addition, researcher presents what other researchers accomplished in order to introduce the reflection practice in the design studio practice, which could lay the ground for developing a reflection technique for the research tool (ALT).

The author listed fifteen techniques which present different modes of reflection-on-action or delayed feedback, and categorized them under four categories. These categories reflect the role of participants, ranging from teacher involvement as a main participant in the reflection process, to the students as individuals.

6.4.2.1 Instruction - Centred Techniques:

With this technique, the design tutor provides students with certain types of knowledge and skills in various formats, either as a lecture or demonstration. These materials aim to inform students about general concepts and provide opportunities to reinforce the relationship between new ideas and previous learning context. The technique builds upon the idea that the design tutor usually identifies from the students' works common needs or skills, and shortage of knowledge about specific issues in the design practice. So, the tutor prepares a lecture or demonstration that aims to present the required knowledge, and to relate it to the previous project. The lecture and demonstration can cover various aspects such as: generation of ideas, drawing's analysis, and formulating designer's intention (Quayle 1989).

6.4.2.2 Individualized Techniques:

These techniques are based on the fact that each student has an individual learning need, speed, and attitude, and that different students show different attitudes and behaviours during the design process. Therefore, to improve their condition, design tutor has to treat students differently. Individualized

techniques allow students to choose the right technique suitable for their need and to apply it in their own time. These techniques can take different formats such as course manual, after-project design handout, or computerized learning programme (Quayle 1989).

6.4.2.3 Interactive Techniques:

The interactive setting in the design studio creates a rich learning environment and allows students to learn from one another. These techniques encourage student and tutor to interact with each other, which could raise the understanding of a specific issue, and build up awareness of certain aspects. These techniques can take several formats such as: individual critique, direct or indirect question, comparative analysis, peer leaning, and group discussion (Quayle 1989).

6.4.2.4 Experiential Techniques:

These techniques differ from other techniques by involving student in direct contact with reality. The aim of the experiential techniques is to create a real or similar design experience, in which student could experience their design product and design decision, even though the project is still on paper. The experiential techniques are useful in emphasising the importance of environmental aspects such as site condition and contextual implication for design. The experiential techniques can take several formats such as Design Re-Think and Re-Draw, in which each student exchange his/her project with other students in order to re-draw it in a different scale and finalise the aspects that may emerge from changing the scale. Other formats could be: role-playing, games, and field testing (Quayle 1989).

6.4.3 Design Action Recording Techniques

To reflect upon any design experience, the student has to return to the experience and rebuild the event; rebuilding the event has to be according to the actual data. Therefore, design action has to be recorded and documented in appropriate formats in order to allow students to return to it later. Recording the design process has to capture as much as it can in order to minimize the possibility of interpretation, in which interpreting the design action without solid information could divert the learning activities from the real experience.

There are different techniques and methods learners can utilize to record and capture experience. Listed below are the techniques that are suitable for architectural students; each one of these techniques could capture and record certain aspects in the design process, but together they could draw the complete picture of the design action, and provide solid materials for students to reflect upon.

6.4.3.1 Sketchbook

Sketchbook is a well-known technique for architectural students. In the sketchbook student draws and records most of the design process and concept generation in addition to the concept's development. Documenting the design process could take different formats, like sketches or text for example. Gibbs (1986) claims that:

> *Log books are also sometimes used in art and design and architecture courses where it is important that fleeting emotional responses to draft ideas and plans, rough sketches and the like are not lost, but are collected to help subsequent development of the ideas. Such jottings are especially useful in discussions with teachers and to aid reflection.(p. 34)*

6.4.3.2 Video and audiotape

This is a secondary technique that students could utilize to record the design session. The importance of such technique comes from its ability to capture certain aspects in the design process. These aspects cannot be captured by other techniques such as facial expression and body movements. Theses aspects could represent the cognitive process and the emotional moment (Cotton 1995). In addition to that, this technique provides student with a reminder aid during the reflection activities. As Cotton (1995) explains:

> *Video and audiotapes for an immediate reminder of what happened have two uses: First, they act as a memory aid . . . Second, they help get over serious problem with learning from experience. If you are in the middle of things, your attention cannot be focused all the time on what is best for learning; you tend to get involved, so that selective attention starts to work and you may miss some essential point of experience. When you have the chance to see the events again you have much better chance to balance and select from learning. (p 116-117)*

6.4.4 Design Media

During the design action, designer, either to conduct design or to present it, has utilised different media. These media consists of different types of representation such as: sketches to represent the development of the design concept and idea generation, verbal communication to represent design conversation between designer and others, and written documents which represent some design aspects which need to be recorded in written format. These media reflect the richness of the design activities, and the various types of knowledge embedded in them.

Designer utilizes all of these media at the same time without distinguishing one from the others because each one could serve different purpose and all of them, collectively, could help designer to conduct design activity and document its process in a tangible medium. Each one of these media reflects specific aspects in the design practice, and holds different types of knowledge that are able to enrich the process of designing; and if they are utilized correctly they could develop students' design skills and their communication means. For this research we are going to concentrate on the main one, the sketches, as others are considered as means of explanation of the sketches. To investigate the nature of the sketches, we are going to approach it from two viewpoints. The first one is from the practitioners' perspective and the way they utilize sketches; the second one is from the researchers' side, and how they could analyse and study sketches and what they have to consider in studying them.

6.4.4.1 How designer utilizes sketches

Sketch is the most visible medium in the design's media, and the main tool in presenting and documenting the design process. The sketch is the architect's language, but everyone employs it differently. There are two main viewpoints among practitioners regarding the role of the sketches during the design process Herbert (1993) points out:

- First: for some practitioners, sketch acts as recorder of the mental processes, the designer utilizes the sketches to record his/her mental

activities, and to represent them to others, which means "think and draw";

- Second: for others, the sketches have an active role during the design process, for the designer establishes a kind of two-way path or interaction relationship between himself and the drawings. So the cycle of drawing, modifying, and drawing while thinking exists between designer and drawings. Herbert (1993) describes this viewpoint as

> *" active participation in which the designer does not segregate the thinking process from the drawing process*" (p. 02).

This second viewpoint supports Schön's (1983) argument in describing design action as reflective conversation between designer and design situation, and the medium for this conversation is the sketches. On the other hand, Gabriela Goldschmidt, in answering the question " What kind of reasoning does sketching represent?" describes the process of creative design:

> *". . . as an interaction of arguments and moves. Arguments are the labours of the designer's mind, the explorations of the task and the reasoning about it. Moves are the physical motions generated by the arguments. Moves are what psychologists call the behavioural aspects of human activity. The architect's moves produce the drawings and they supply essential new food for the arguments*" (Arnheim 1993, p. 15).

6.4.4.2 Constraints on studying and analysing sketches

Although sketches play an important and critical role during the design process, they also have limitations and create some constraints on the researcher's path to wards understanding design sketches, as Arnheim (1993) argues:

> *The creative process of designing, being an activity of mind, cannot be directly observed. The sketches, done for the eyes and directed by them, make some of the design plans visible. They not only supply the designer with tangible images of what his or her mind is trying out in the dimness of its own freedom, but they also permit the observer or theorist to catch a few motion glimpses of the flow of creation. (p. 19)*

Generally speaking, some of the sketches are impossible to investigate independently, because they are the product of either mental activities or feelings; therefore, they are un-descriptive even for the person who experienced them (Goldschmidt 1991,1994; Herbert 1988,1993; Arnheim 1993; Lawson 1994). In addition to that, there are also important aspects that could guide and improve the analysis process of sketches, which could be considered as characteristics of the sketches.

1. Private tool:

The designers, as creators of the sketches, consider sketches as private tools they produce for their own usage rather than for others, as Lawson (1997) argues; *"Designer did not produce sketches for others to understand, it was his working tool"*. Therefore, the designer has an important role in analysing and studying his/her sketches.

2. Part of the picture and Uncertainty:

As the designer considers sketches a private tool, this consideration affects the production process of the sketches. Therefore, designers, while conducting design and utilizing sketches, do not concentrate on what others could understand from their sketches, but utilize them for the sake of generating ideas, and developing the design concept. Lawson (1997) argues that

> *"The designer was not concerned therefore either to produce a drawing which explained itself, nor was he concerned with a design which was totally resolved"*. (p. 174)

Therefore, the sketches of any project have to be treated as one set, and the sequence of the production has to be obtained from the designer only.

3. Transition:

The preceding features could explain the idea behind considering sketches as transition between two stages. Sketches could neither explain completely what happened nor what might come next. As Herbert (1988) puts it, sketches are located between "an unresolved past and an unpredictable future". Therefore, we as researchers, cannot isolate the sketches from their context, and we have to understand the environment in which they were produced.

4. Interaction:

The last characteristics of this medium point to this: in order to understand sketches, researcher has to accept the reality that sketches are a result of interaction between two main aspects in the design practice, mental activity and graphic process. This interaction affects the procedure of analysing sketches whereby it directs researcher's attention to the nature of sketches and how they were produced, and, in addition how different aspects interact during the production process. As Herbert (1988) makes the point, "*Understanding sketches requires considering how mental and graphic process interact in the real time of the design task*". Therefore, considering the intangible aspects such as mental activities has to be included in the analysis process, and the researcher has to widen his/her vision in that process.

6.5 Conclusion

This section as the main part of the literature review tries to connect various and different parts to the research discipline. Investigating researchers work that have been conducted to improve architectural education in the design studio is the aim of this section, which began with the presentation of general research approaches for architectural education, and ended with practical techniques to improve the design practice inside the design studio.

The first subsection concentrated on the research work on the three stages of the design practice, before, during, and after. This part was followed by the design teaching models, in which different design tutors tried to create the appropriate learning environment and respond to the emerging social and cultural needs and in which students could obtain the knowledge, and acquire the skills to deal with these issues professionally. The last subsection is devoted to the presentation of practical techniques that aim to improve students' design practice, such as replicating technique, reflecting technique, and design action recording techniques, in addition to the techniques and constraints in studying sketches as the design medium.

In conclusion, this section has tied to relate the preceding sections in this chapter to architectural education and mainly to design studio, and to provide researcher with the required knowledge and techniques to develop research tool, the ALT, which is the subject of the following chapter.

Chapter Two

Architectural Learning Tool

1 Introduction

After determining the main problems in current architectural education according to my personal investigations as students of architecture in various levels and as a practising architect, the following conclusions were reached:

1- There is a false understanding of the nature of the design practice, and how students could develop the design skill?
2- Students do not have any significant role in developing their design practice, and the design tutor is fully responsible for that.
3- Design education and practice in school is geared toward presenting and discussing the product more than the process.

The existence of these problems have implications for architectural education and the design practice in design studio; therefore, the research aims to develop a design learning tool that could help students to take the lead in developing their design practice, and to expand students' vision about the nature of design practice.

For the ALT to solve these problems, it has to concentrate on three aspects:

1- Convert the design studio environment into a learning environment.
2- Develop a design-teaching model able to support the learning environment.
3- Re-design the design crit to be learning instead of an assessment tool.

The literature review has been conducted to verify the potential of these aspects and support the argument that the ALT is able to overcome the stated current problems in the architectural education and the design practice at the school of Architecture.

The preceding chapter investigated these aspects at different levels. It started by highlighting the different characteristics of the teaching and learning environment and what the role of students and teacher are in each environment. In addition to that, in the learning environment student has to share the responsibility with design tutor and be an active participant in contributing to the learning activity, and engaged with the provided knowledge and skills.

Engaging students with the learning activity requires them to integrate their prior design experiences with the new experience, and the means for that is the reflection action. The reflection practice aims to connect the prior experiences with the new one, and allows students to learn from their past experiences in order to improve the new one. There are different reflection techniques described in the first chapter, that ALT has to adapt and implement for the learning environment to occur in the design studio.

We can realise from that, creating the learning environment in the design studio is not an easy task, but requires different modifications in the studio practice, according how we perceive the design practice. The later was achieved by investigating the nature of the design action, the way researchers described it, and concluded with the adaptation of Schön's paradigm in describing design action as reflective conversation between design and design problem. In other hand, the former was achieved by investigating how other design tutors developed a design teaching model for specific purposes, and created the appropriate environment for students inside the design studio.

This led us to the second aspect, which is about developing a design-teaching model for the ALT. The ALT teaching model has to include different stages, and starts with the stage of designing, then replicating, and ends with a stage of re-designing. All of these stages aim to engage students in group work and involve more than one mind in solving the design problem, in which students share the experience and expose themselves to others design experiences and practice.

For the ALT teaching model to be successful, the assessment means for the design studio, the design crit, has to be modified and re-designed to be centred on learning, instead of an assessment means, which is the essence of the last aspect. According to the literature review, modifying different aspects, including the design crit layout and the role of students and design tutor, could achieve that.

As a whole, this summary aims to link the previous chapter, the theory, with this chapter, which aims to explain the research tool, the architectural learning tool. The Architectural Learning Tool is presented in this chapter according to five questions, or domains:

A. What is Architectural Learning Tool?
B. How could we create and execute ALT?
C. What could ALT provide students with?
D. What could students do during ALT application process?
E. Which type of data could we obtain from the ALT experiment?

The first domain concentrates on describing the research tool according to the research objectives. The second one explains the process of creating ALT; then follows the explanation of the expected skills this tool could provide. After that, the fourth domain explains what the students are expected to do and carry out during the experiment. Finally, the last domain highlights the expected experiment's data that we could get hold of from the research experiment. Therefore, this chapter is considered as a transition between the theory and the results chapter, an exploration of how the theoretical information translates into a practical tool.

2 What is Architectural Learning Tool?

Architectural Learning Tool is a design-learning tool whose aim is to allow students to develop their design practice, and improve their design skill, and sharing the responsibility of the design practice in the studio with the design tutor; in addition to allowing them to learn from their prior design experiences. The description of ALT could follow the sequences of the research objectives, and could be segregated according to the implications and requirements of these objectives, and could be considered as the characters of the ALT.

2.1 Improving students' design practice

For ALT to achieve its objectives it has to improve different aspects, and to have some implication on others, in addition to introducing other issues in architectural education and design studio practice.

2.1.1 Developing critical analytical skills

The targeting tool aims to allow students to analyse their design practice and that of others, whereby the acquisition of the analytical skill could allow students to understand, and widen their vision of the design practice. Therefore, they are not only conducting design but also learning from it. Deconstructing the

design process into manageable and understandable chunks, without losing the essence of the whole, is the theme of this skill. The Reflective Practice Theory's framework could provide us with the required means to analyse and deconstruct the design process. This deconstruction has many applications in design presentation and discussion during which it organises these processes as telling a story, or narrative (Lawson 2001). So, the presenter could organise the design presentation around specific aspects and channel the discussion toward the preferable directions.

This analytical skill has to adapt different sub-skills to complete the process of analysis such as: form analysis, and drawing or sketch analysis. The first one enables students to deal with end product of the design practice, and the second one with the most important stage in the design practice, the conceptual stage. All of these properties of the analytical skill have to be adapted for the ALT to achieve its objectives, and student have to pair in mind the constrains of dealing with the sketches that have been mentioned before.

2.1.2 Establishing a position for the reflective practice in the design studio

The importance of the reflective practice resides not only in the fact that it connects the prior experiences with the one that follows them, but also that it may prepare students for new experience, and encourage students to think while they conduct design practice (Schön 1982). The ALT has to adapt the three types of the reflective action that is, reflection for, in and on-action, and this adaptation has to be a practical one, by introducing new reflective techniques in the educational system of the design studio. In addition to that, the reflection's three stages have to be identified in the studio practice, which could have some implications on the setting of the design experiment sequences.

2.1.3 Introducing the role of precedents

The precedents not only provide designer with a mental image during the design process, but could also enhance the process of ideas generation and concept development. Therefore, the role of the precedent and the way students could build up their own precedents' library have to be integrated in the ALT's

educational system; therefore students could improve their design practice and integrate other designers' approaches with their own.

In general, for the ALT to improve student's design practice it has to concentrate on three aspects:

a- How to conduct design action;
b- How to discuss design products.
c- How to present design works;

The first one of these concentrates on the action of design, the second one on its description while designer is conducting the design, or afterwards, and the last one concentrates on presenting the end product(s). Therefore, these three aspects have to be integrated and the ALT has to have some implications in improving and developing them.

2.2 Increasing students participation in the design studio

For the design studio to be a learning environment, and the participants to be active and interacting with each other in an active mode, the design tutors have to change their considerations about students' role in the design studio practice. Therefore, to activate students' participation there have to be some modifications in the design studio practice namely:

a- Design studio environment has to be Student-Centred.
b- Reconsideration of the students' contributions in the design studio.
c- Re-Designing the design crit to be learning, rather than a judgment medium.

All of these elements have to be considered and adapted by the ALT in creating the required environment in the studio. The first and the second elements are interrelated because to accomplish the first one the second one has to be considered. Re-designing the design studio for it to be student-centred could be accomplished by considering students' contribution as valuable as the contributions of practitioners and design tutors. The third element calls for re-designing the assessment means, the crit or jury, by formulating it as "student-led crit" (Didge 2000), but not completely under the control of students but

partially, and design tutor could facilitate the crit. Therefore, the design crit could become a learning medium and students could participate actively because they are in students' environment. The implications of this modification could bear on how students present and discuss their design process to/with others.
In general, the current crit system tries to mirror the professional practice setting and applies it inside the design studio (Anthony 1991). This aim is understandable, but we have to remember that the design studio is a learning environment, in which students have to learn how to behave in real life, but also have to learn how to practise design. So, the learning environment has to dominate the professional reality. Therefore, design crit has to be re-considered and converted into a learning tool for students to learn how to practise design professionally, but also to learn how to design and asses their design practice.

2.3 Exposing students to others' design experience

The design studio is considered as an active and interactive environment in which each participant has to exchange and share experiences and opinions with others in order to improve and assess them. Therefore, this aspect could be accomplished by:

A- Deconstructing one's design practice and that of others, by utilising Schön's framework in describing the design practice.
B- Replicating other students' design process to draw the line of thoughts of others.

The deconstructing and replicating actions are practical means for students to look at other designers' design work, not as end product, but as process. In addition students could widen their view about the work of others. Therefore, these means have to be integrated in the ALT, and students have to realise them to expose themselves to others' design practices.

2.4 Increasing students' understanding of the design practice

This objective comes as a result of the two previous objectives, because students could increase their understanding of the design situation by activating their

participation and exposing themselves to others' design practices. Architects utilise the solution-focus approach in tackling the design problem so they understand the situation as they propose solutions (Lawson 1980). Therefore, as they propose, present, and discuss alternatives to others their understanding could increase; in addition to that and as result of increasing students understanding, students could consider other students' viewpoints in approaching the same design problem.

3 How to create the ALT

After presenting the characteristics of the ALT, and what ALT is, this section is devoted to discussing how to create this tool. The creation of the ALT depends on fulfilling some conditions and adapting some elements.

1- ALT has to include a means of encouraging students to work as a group, for the interaction between students has to be live and active, which could encourage individual within the group to externalise his/her design practice. Furthermore it should allow more than one mind to work at the same project, which could result in improving design product and practices.

2- During the design presentation and discussion, students have to impose a framework in these actions. This framework is not only organizing the sequences of the presentation, but also allowing presenter to present the design action not as product but as process. In addition, the framework directs the listeners' discussions of, and feedbacks on the presented themes.

3- ALT has to include a stage of returning to a completed design work so students could reflect upon, and analyse, this experience for them to extract some lessons from the experience, and identify the weak and strong sides in their design practice.

4- The stage of re-designing a project in the manner of other designer is considered as a valuable means of exposing students to others' design modes and practice. In consequence, ALT has to include such stage to accomplish the objective of exposing students to others' design experience.

4 What ALT provides students

After presenting ALT's description, the constraints, and the parameters of the creation process, and before presenting what we expect students to do, we have to explain what ALT could give students, in addition to what students could acquire and obtain from the use of this tool.

1- New mode of practising designs either in presentation or discussion stages and, possibly, during the conduct of the design act also, by deconstructing design practice according to the ALT's framework.
2- New means for analysing design practice with focus on the process rather than the product, by replicating other students design practice.
3- A means for helping students to expose themselves to others' design experience, by re-designing the project in the manner of other designer.
4- A means for justifying students' design practice.
5- A means for learning from prior design experiences.

Based on these means and modes we could explain in more detail what we, as researchers, expect from students after utilising ALT.

5 What we expected students to do during the process of applying ALT

Based on the previous sections which highlight the characters of ALT and the tool sequence, students are expected to:

1- Practice and conduct design discussion with clear view of what they are doing, which should guide their discussion toward the preferable directions.
2- Learn how to explain and present the design action in well-organised manner.
3- Learn how to externalise their design process in meaningful and truthful manner, because they are mainly presenting it to other students.
4- Organize the discussion and presentation activities in a way that encourages other students to be active, because they could follow the sequences and could provide the presenter with valuable feedback.

In general, all these aspects are practical actions that students could conduct and practice during the ALT's application.

6 From the ALT's experiment, which data could we expect?

The ALT experiment could have mainly two phases: designing and discussing. Each one of these phases could hold different data and we, as researchers, could extract different findings.

A. Designing Phase:

At this phase, students conduct the main part of the design action by generating design ideas and developing design concepts, and the means for conducting such action are mainly by the sketches. Therefore, for researcher to track the design development, the drawings of designing phases have to be studied carefully within the context of studio environment, and with the assistance of the designer.

B. Discussing phases:

Group activities occur at this stage during which each student presents his/her design work to others and formulate his/her presentation in the form of narrative; subsequently, other students could follow this pattern in their discussion and direct their enquires and feedbacks toward the narrative stages. Formulating the presentation and discussion according to this format allows students, both listeners and presenters, to concentrate on specific stages that reflect the presenter's concerns. The aim of this phase is to encourage students to externalise and explicit their design practices to others who can then asses the work and provides them with valuable feedbacks and comments.

Audio and video recording to document the whole event, and allow researcher to analyse and interpret these data correctly could capture the students' discussion phase.

Chapter Three

Qualitative Research

1 Introduction

The research development process has passed through different stages in order to formulate the research topic and narrow down its focus to the area of how best to develop students' design practice. This process started from the vagueness period to the ultimate concentration on defining the research area, and explaining the research topic. In consequence, this focus was not able to produce a clear picture of how students developed their design practice and learned from their prior design experiences; therefore, additional investigations had to be done. As a result of that, the decision of considering research method as qualitative has been taken, which aims not only to test the research hypothesis that was at some stage not clear, but also to increase our understanding of the phenomena of students design practice (Byrne, 2001& Hoepfl 2001).

The qualitative research method provides us with the required means to test the research hypothesis and investigate the nature of the research domain in more details. This research method not only allows researchers to observe how students actually conduct design action in real design studio setting, but also allows them to identify the main characteristics of the designing action and practice, which, at the end could allow researcher to identify the main aspects that constitute and enhance design practice. Therefore, the qualitative research method is utilized to:

1- Increase researcher's understanding about the nature of students design practice (Byrne 2001).
2- Identify the main aspects that could enhance and improve this action.
3- Provide researcher with an internal description of the students design practice (Burns 1993).

In addition to that, there are different tactical reasons behind considering the qualitative research as the research method, such as the following:

1- As the nature of the qualitative research method, and the research hypotheses are being generated during the experiment, the data are considered as sources for generating these hypotheses (Weinreich 1996).
2- This research method allows researchers to observe subjects in real practice setting, rather than in laboratory. So, the acquired data are a

reflection of what was actually experienced during the design activities (Hoepfl 2001).

3- The research domain is relatively new, and untested, so this type of research method could be the best, because the subjects could express their feelings in informal mode, and the researcher could have the opportunity to investigate this domain in more details to accomplish his/her objectives (Hoepfl 2001).
4- This research method could allow researcher to identify the real cause and effect of different elements that constitute the relationships of the design practice (Burns 1993).
5- It also allows researchers to utilize different data collection methods in a single experiment, for example: direct observation or interview. This flexibility could allow researcher to investigate the phenomena in more details, and tackle it from different perspectives (Hoepfl 2001).
6- The nature of the qualitative research method, which could be commenced while the research topic is not well defined, allows researchers to widen their vision and integrate different disciplines to increase their understanding of the phenomena(Byren 2001).
7- As a result of increasing researcher's understanding while the experiment is in progress, there will be no distinction between the phases of data collection and data analysis (Burns 1993).

Taking into consideration these tactical reasons in choosing the qualitative research method did not prevent researcher to take into account some of the drawbacks of this method, in order to minimize their affects. The main shortcomings of the qualitative research method are: (Key 1997)

1- The data analysis is considered as researcher's personal interpretation.
2- There is a risk in generalizing the research findings.
3- This method cannot control the experiments' factors.

In designing the ALT experiment, we try to minimize the role of the first one by building our arguments based on the subjects' statements and agreements.

2 Research data collection techniques

As for the nature of the qualitative research method, which allows researcher some flexibility in utilizing different techniques for data collection, the researcher employs three main techniques:

2.1 Observation

Direct observation of students' design practice is conducted in the design studio space. The observation activities could concentrate on the discussion and the presentation phases because they are space and time-limited, but not on the designing phases because they are not space and time-limited. Observing students in real design studio environment could allow researcher to capture the real subjects' experience, and what they actually feel in the real context (Key 1997). Regarding the researcher's role during the design practice, the role will be in a form of "limited interaction"(Key 1997) in which the researcher is present at the scene in the studio, but with minimum interaction with subjects. The researcher could interact only whenever the need arises. The reason behind that is to allow subjects to practice design in normal mode. This involvement must not interrupt subject's participation but it has to be in a form of guidance only (Hoepfl 2001). The design sessions could be divided into different stages to allow researcher to impose the ALT's framework in some sessions while leaf others to be as control sessions.

The observation sessions could be recorded either by video or audio recorder to capture and record subjects' behavior and interaction. Also, the researcher could take notes, which could act as remembrance aid for him during the data analysis.

2.2 Interview

The reason for conducting the interviews is to clarify some aspects that may be identified in the observation sessions, and that need more clarification from students themselves (Byrne 2001). The interviews could follow different formats; either as group or individual interviews, and each one could be conducted according to different types either as informal or conversational interviews, semi-structure interviews, or standard open-ended interview (Hoepfl

2001& Byrne 2001). Each one of these types could serve different purposes. Research interviews could be conducted in two formats:

- The first one is a group interview to get students' general feedback, and allow each student to explain his/her opinion in front of other students.
- The second format is an individual interview, in which each student could have the chance to express his/her opinions without the influence of others, according to what he/she did or said in the observed sessions.

Because of the time frame of the interviews within the experiment sequences, we could have two group interviews, one after the completion of the experiment, and the second interview could be after one academic year, to allow students to implement the ALT or part of it in other design studio projects. In addition to that, each one of the group interviews could follow a specific type; for example the first one could adapt the informal conversation format to capture the group's overall opinions about the ALT, and the second one could adapt the simi-structure format to concentrate on specific aspects that may have affect the design practice in long term mode, and could be considered as a means to improve ALT.

The individual interview could adapt the standardized, open-ended interview. This type of interview allows researcher to refer to students' work, ask them about certain aspects of their works, and give them the opportunities to explain these aspects in more details. The interview questions are not strictly about specific aspects but about the inquiry area, in which these types of questions could allow researcher to modify and change the questions according to the students' responses (Hoepfl 2001).

2.3 Questionnaire

The questionnaire is considered as a data collection method for the quantitative research method, but we could utilize it as a means to clarify some aspect through using the close ended questions (Youngman 1978). Therefore, the questionnaire can be distributed to the students immediately after the completion of the experiment to capture and record their immediate feedbacks. The

questionnaire is divided into five sections according to the main part of the ALT, and concludes with an open-ended question to provide students with another opportunity to express their opinions about ALT in general.

Chapter Four

Design Experiment

The main objective of this experiment is to help students to externalise their design process for researcher to monitor the sequences of their practice and, in addition, to identify the main elements that could enhance and improve their design practice. Consequently, our understanding of such domain should increase, which could help us to conduct more research to improve the discipline of students' design practice, and make the design studio more fruitful. The design experiment consists of three stages that reflect the essence of the ALT, and are considered as the elements of the ALT's design teaching model:

- Designing Stage;
- Replicating Stage;
- Re-Designing Stage.

But before presenting the experiment stages and sequences, there are some aspects related to the experiment setting that have to be clarified.

1 Experiment Setting

To design the experiment and determine its sequences, various issues have to be studied deeply and considered for the experiment to achieve its objectives and clarify the required aspects.

1.1 Subject Profile

ALT, as a learning tool, aims to provide students with a new design method and mode. As the numbers of the subjects are eight students, therefore, determining the subjects' profile and the appropriate stage in which to apply the ALT are important aspects that need to be clarified. Using the UK architectural educational system as a model that consists of two parts separated by one year out for professional practice, leading to the diploma, it has been found that the appropriate stage, either from students' characters stand point, or studio curriculum, was the second year for the following reasons:

1. The nature of the second year as a mid-way point in the British architectural education system, in which students have already acquired basic skills from the preceding year; and,
2. The students, at this level, do not yet formulate their own design strategies and methods; so,

3. The students' design practice, as a mode of designing, can easily accept and adapt new design models and techniques.

1.2 Studio Setting

For the application of the ALT to be successful, different adjustments in the design studio practice have to be done and to take place. The main aim of these adjustments is to increase students' participation and encourage them to direct the discussions and other activities in the design studio to match their needs and requirements. Therefore, this adjustment has to convert the studio practice into a "student-centred" environment (Nicol 2000). This environment considers students as central players in the learning environment, and the design studio tutor as a facilitator; in addition to that, the design crit has to be, not just a means of judgement, but also a means of learning (Anthony 1991 & Doidge 2000). Therefore, the design crit has to be modified to adopt the new role, and create the setting for students to practise their new roles.

Creating student-centred environment in the design studio may not be a completely useful setting for design studio, because it considers design studio as fully under the control of students. Doidge (2000) criticized the student- centred aspect and reached the conclusion that: students consider the design crit as a means for professional knowledge and experiences, and therefore, value the tutor's comments and judgments more than those of their colleagues, even though, they are in a position of defending rather than learning. So, students are willing to listen to their design tutor and juries more than to other students. As a result, the design crit system is converted, in this experiment, to be a mixture of student and tutor involvements by arranging the crit's sitting layout in such a way that the students' sitting area has become the focus point with the design tutor(s) sitting in the back rows. Therefore, the presentations and the discussions are directed toward students, and the design tutors are given the chance to comment and give their feedbacks at the end of the crit. Furthermore, the new format of the design crit allows students to present their work and discuss it in the form of sketches rather than final presentation drawings. So, students could utilise their sketches book in the crit and present the drawings that reflect the design process more than the end product.

1.3 The Experiment Project

Choosing the appropriate project for the ALT experiment was not a straightforward process; because there were different aspects that have to be considered in the selection process. The main aspects were: at which stage of the design practice the ALT could have implications, and at which stage we could monitor the students' design practice.

As the ALT is aiming to improve students' design practice, which include the way they present and discuss their practice, and, it is hoped, the way they conduct design action, it concentrates mainly on the presentation and the discussion stages. So, the project has to be a short project with concentration on the conceptual phase, and how students present their design works, and discuss it with others.

The project was to design a small pavilion in a park. The building was for the National Fairground Archive Interpretation Centre (NFA). This centre is intended to host the collections of materials of the fairground. These collections could cover all aspects of the culture of travailing show people, their organizations as community, their social history and every day life, beside the artefacts and machinery of the fairground. The students were provided with the design brief which explains different aspects related to the project, site, and client's needs (Refer to the appendix - C for more details about the project). This project was ideal for such experiment for many reasons:

1- The pavilion project type focus mainly on the building form.
2- The small numbers of project's elements allows students of the second year to concentrate only on one or two aspects during the conceptual phase.
3- Locating the project in a park minimises the number of legal issues and gives the designers the freedom in their design process.

1.4 The Time Frame

On account of the type and the size of the project which concentrates only on the two stages of generating ideas and developing design concept, and of presenting and discussing these concepts, the time frame was limited to five weeks. The idea behind that was to allow students to work only on the two stages and not get involve on the development stages with the complexity of the details of technical and structural aspects. So, students could generate the idea and develop it to certain level, and present it to others based on the sketches, initial drawing, and study models.

1.5 The Experiment Sequence

Based on the nature of the experiment's stages, in which each depends on the completion of the stage that precedes it, and given the difficulty which may occur if students know in advance the "complete" sequence, the whole sequence and structure of the experiment was hidden and students commence each stage without knowing what will come next. Students are therefore introduced to the next stage after completing the one in hand, and so on.

2 The Experiment Stages

The ALT's design teaching model consists of three stages, with the first one considered as a regular designing session, while the remaining stages are practical reflection techniques. The replicating stage allows students to draw the line of thoughts of other students, while the re-designing stage aims to allow students to experience the design mode of another designer while at the same time allowing better to view his/her design mode from different perspective.

2.1 The Designing Stage

At this stage, the project was commenced as a normal design studio project, and the researcher was aiming to allow students to utilise their own design method and mode of communication without imposing the new one. There is another reason for that, which was to use this stage as a control session, and at the end, conducts comparisons between this stage and others that adopt the ALT's framework.

The designing stage commenced with the discussion of the design brief and a site visit was organised, followed by a client's meeting in addition to visiting the Fairground archive at the University of Sheffield. During the first week, the students completed the design's conceptual phase and conducted several desk crit sessions with the studio tutors. At the end of the week, considered as the end of the first stage, a more formal design crit was conducted; this was formulated partially as a "student-led crit" (White 2000) to encourage students to be active and participate in the design discussion and presentation with a minimum involvement from the design tutors.

2.2 The Replicating Stage

After the first formal design crit, the researcher introduced ALT and its framework with emphasis on the new communication means and the way students could utilise it. After that, students circulated and swapped their projects. Following this process, each student was asked to explicit his/her design process to the colleague, using drawings, sketchbook(s), and model(s) according to the ALT's framework, in which student deconstructed his/her design process according to the four activities framework, that is, naming, framing, moving, and reflecting. They tried to identify these stages for the other student. In the second part of this stage, and after receiving the design work from the other student and listening to the deconstructing presentation, each student wrote and drew a replication report that replicated the design process of the other student according to the ALT's framework, and based on the presentation of his/her partner. The replicating report represented the designing sequences according to the provided sketches and models.

At the meeting that followed, each student presented his/her replication report, which allowed other students to comment on, and justify, their ideas and intentions. It also allowed the two students involved to defend their ideas and clarify them where their thoughts had been misinterpreted or misunderstood. The replication stage is considered as a stage of exposing students to others' design practice and experience, in which each student could present and discuss his/her design practice according to one specific framework, which allows students to maximise their participations in presenting or discussing activities,

and externalising their design process as much as they can. The replicating stage aims to create the appropriate environment for students to communicate with other students about their works, and expose their design practice to others, for them to asses. It also provides the student with the feedback they may need, not about the whole design practice, but about specific aspects, such as how they approach the design problem, how they name the main aspect in the design problem, or how they frame this aspect. Consequently, other students could concentrate on specific issues, and direct their discussion toward specific moments in the design process.

2.3 Re-Designing Stage

At the end of the replicating stage, and during the last week of the experiment, each student was asked to re-design the project in a new site, but in the manner of the first designer. The reason behind changing the site and re-designing the project in this manner was to encourage students to fully understand the other student's scheme, and extract the essence of the other designer's concept. Each student was allowed to communicate with the other student during the re-designing stage to clarify any aspects, but the new scheme had to reflect the essence of the first student's concept.

At the end of the third stage, the final design crit was conducted, with each student presenting the first and the second scheme and conducting comparisons in the following formats:

1- Comparison between the design modes of the same student in the two schemes.
2- Comparison between the design approaches of the same student at the two sites.
3- Comparison between the two students, and how each one had handled the same project at the two sites.

This stage allows students to be exposed to others' design mode and experiences, because designing in the manner of other designers cannot be accomplished without fully understanding their design practice and modes. In addition to that, it allows researcher to track the design process of each student and identify the strong and weak features in their design practice.

Chapter Five

Results and Discussions

1 Introduction

This chapter aims to present the main contributions of the research, and commences with the methodology of analysing the data. The data analysis section is followed by the section on results that focuses on what ALT, as a learning tool, provides students with for them to improve their design practice. These results have many implications for architectural education in the design studio, and for preparing students for the professional practice where the implications frame the discussions section that follows.

2 Data Analysis

Qualitative research, by its nature, aims to increase the researcher's understanding of the research phenomena, and to widen his/her vision of such domain. The nature of this aspect of the research has significant implications on the size of the samples, the role of the researcher in conducting the research, the means of data collection, and the means of analysing these data (Byrne, 2001; Hoepfl 2001).

Direct observations and in-depth interviews with subjects are the main research technique for collecting data; furthermore as an additional research technique, questionnaires have been added to get subjects' feedback about specific aspects. The aims of these data collection techniques are to capture and record subjects' actions, attitudes, and feelings while they are in action, and to clarify some aspects related to the research domain.

Due to the nature of the research and the data collection techniques, the amount of the data obtained from them are huge, as they include transcripts of the recorded sessions, the researcher's notes, and the questionnaires, in addition to the subjects' drawings, sketches and models. The subjects' drawings, sketches, and models have been studied and utilized as the means of discussion during the individual interviews (Byrne, 2001; Hoepfl 2001; Weinreich 1996).

In order to manage the amount of data, and organise the data analysis activity, the framework proposed by Bogdan and Biklen (1982), has been adopted, and the essence of these sequences has been employed in the data analysis procedure in which Bogdan and Biklen argue that the sequences of the qualitative research data analysis could be as follows:

1- Organising data;
2- Breaking them into manageable units;
3- Synthesizing them;
4- Searching for patterns;
5- Discovering what is important, and what is to be learned;
6- Deciding what to tell others.

In addition to that, the researcher supports his interpretation, arguments, and understanding of the results by using direct quotations from subjects' interviews and discussion sessions, in which they are given a code name as follow: Lu, De, Ja, Mk, Ca, Ge, Ms, and Vi.

3 Results and findings

This section sets out to present the research findings about the role of the ALT in improving and developing students' design practice, and highlights the main aspects that have been tackled during the exercise to improve the condition of the design practice in the design studio. The presentation of these findings is divided into three categories:

- How to present and discuss design works.
- How to assess design practice.
- How to improve designing action.

3.1 ALT as a communication Tool

How ALT allows students to present their work in an organised and meaningful manner is presented in this section as well as how it encourages other students to provide valuable feedback and comments to the presenter and conduct meaningful discussions with him/her. As a consequence, the activities of presentation and discussion become as a learning tool for both students , the presenter as well as the listeners.

3.1.1 New framework for Presentation

As ALT aims to develop students' design practice, it approaches this domain from the perspective of "how students present their works". The contribution of

ALT in this aspect aims to organise the presentation activity by imposing a new framework. As a result of that, students' presentation became more organised, and targeted toward the aspects that could improve their design practice rather than the design product (Figure 05). This conclusion was supported by how students performance in the presentation sessions and was reflected in the questionnaire.

3.1.1.1 The presentation activity becomes a developmental means for the end product

Presenting students' work via the ALT framework converts this act from that of presentation of the end product only to an act of development the design product also. Therefore, students could get new ideas from other students' feedback; these ideas could be provided by direct or indirect suggestion.

For example, by way of direct suggestion one of the listeners said: *" Do they project out on the street as well?"* , while another came up with: *"Do you have space, like to step back and see the whole picture...?"*.

So, at these queries, students put forward new ideas for the presenter to consider, which could improve the end product about the T. V. walls.

The second example, of indirect suggestion, was when the presenter said:

"I've now got the idea how the hill works."

From this response it appears that the student had the idea of the hill but did not realize its full potential; so, when other students discussed the aspect of the hill, the presenter fully grasped the idea, and developed it farther.

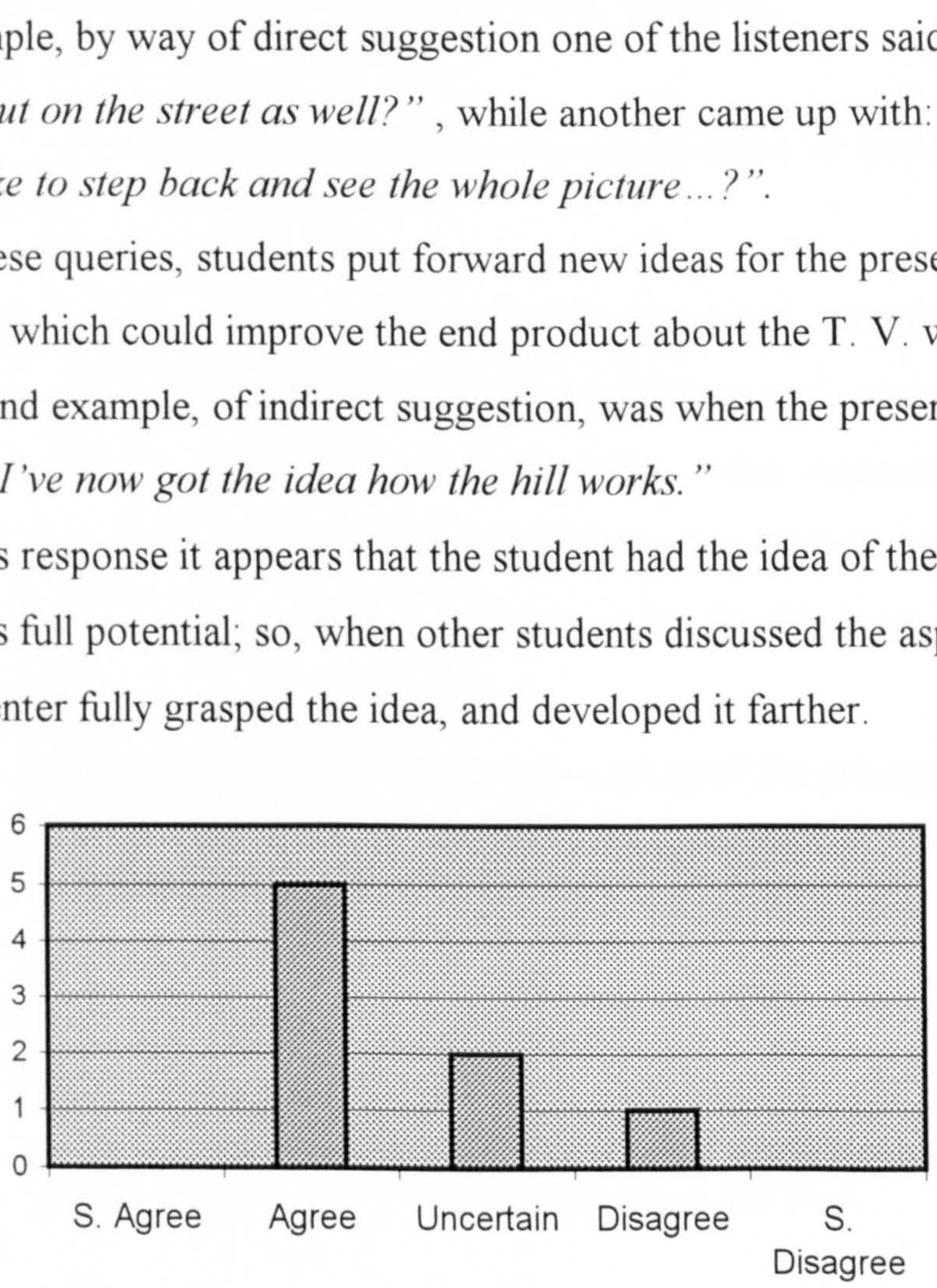

Figure 05 Provides students with new means for presenting their works.

3.1.1.2 ALT allows students to be explicit about their design process

As ALT's framework allows students to be systematic in their design presentation, it enables them also to explicit their design process by providing them with the vocabularies for such action. Explaining the design process allows other students to get the whole sequence of the process, and to tackle any specific moment in the process they may think need clarification, or improvement. In the questionnaire, students did not support this argument (may be due to not understanding the research terminology, or other reasons!), but from students presentation and discussion sessions, it has been identified that the ALT has a significant role in helping students to explicit their design process (Figure 06).

As Ca explicated her design process and rationalized her design decision in proposing a controlling point in her scheme, by saying:

> *" . . . . but then I thought that because they are so spread out that you need a controlling point. . . .",*

She in fact performed two actions, reflection and move. With the reflection, she evaluated the current situation of the plan as "spread out", and suggested a new move, "you need a controlling point". Therefore, other students were able to understand the sequences and direct their discussion toward these specific moments and actions. As a result, other students' feedback were actually reflections of what the presenter said.

Another example was provided by Ja who explained the process of designing the building roof, and explicated thus the design decisions:

Ja: *"At that point . . . . I started thinking about the roofs, and it wasn't working, but I couldn't think why."*
Mk: *How?*
Ja: *"I didn't want to go on boring flat roofs, I wanted a sort of fairgroundy roof but I didn't want a tent or something like that. . . ".*

From this exchange, even without naming the stages according to the ALT's framework, we could see how students could make explicit their design practice, and name its various stages, such as:

- Naming the main issue: *"Roof"*.

- Framing it: *"I didn't want to go on boring flat roofs"*.
- Move: *"I wanted a sort of fairgroundy roof "*.
- Reflection: *"but I didn't want a tent or something like that"*.

So, we can see that the student was able to deconstruct his design process to manageable chunks to allow other students to tackle each chunk separately. Therefore, the student was able to asses the importance of the roof as main aspect, and how he/she framed this aspect and so on. The main achievement of the ALT in this aspect is that it formulates student's presentation as "narrative" (Lawson 2001). The narrative format organises the presentation as a story, during the unfolding of which the student decomposes the process into stages and hierarchies.

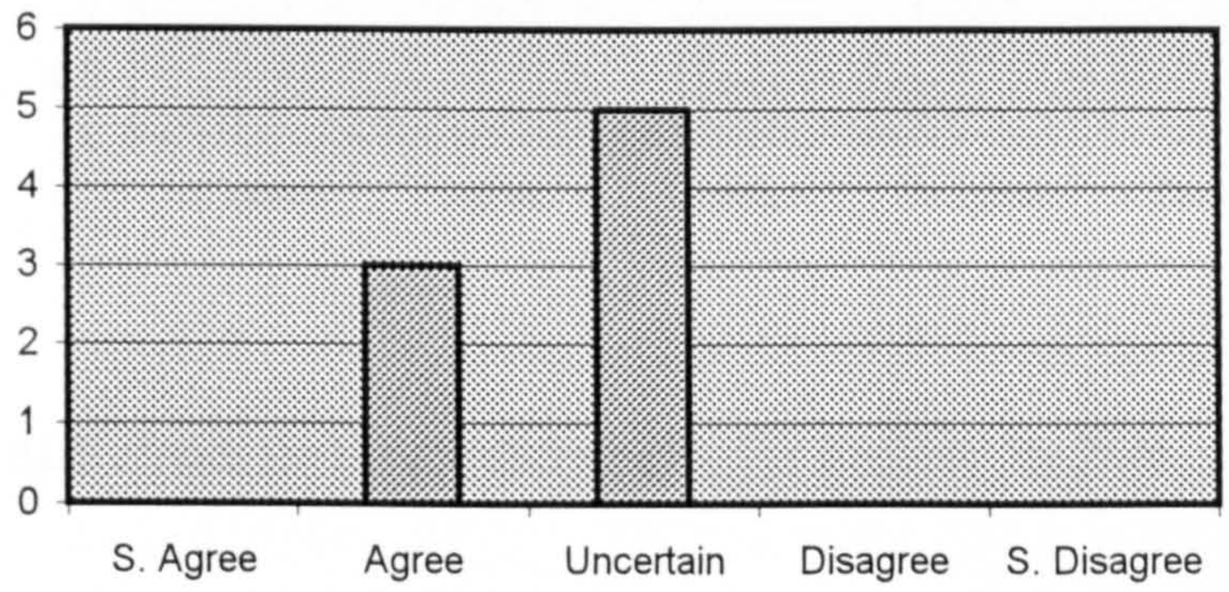

Figure 06 ALT allows students to make their design process explicit

3.1.1.3 ALT creates the base for others' feedback

This aspect of improvement is considered to be the result of the preceding finding, in which the designer explicit the design process and deconstructs its elements so the listener is able to track the design development process, and identify the segment of the design process. As a result of this way of presenting the listener is encouraged to provide the presenter with a valuable feedback about specific issues, and to direct feedback toward the preferable direction. Some students were able to identify this opportunity and they utilised it successfully, while others could not (Figure 07).

It had been noticed that during the discussion sessions, if the student utilized the ALT's framework and presented his/her work according to it, the presentation was more organised and students were able to benefit from it; in addition, other students' feedback was focused and meaningful. Conversely, where the presentation was not organised it was found that the reason was one of two things: either the presenter concentrated on specific issues or detailed aspects without presenting the whole sequence, or the listener guided the presenter toward what he/she thought was important.

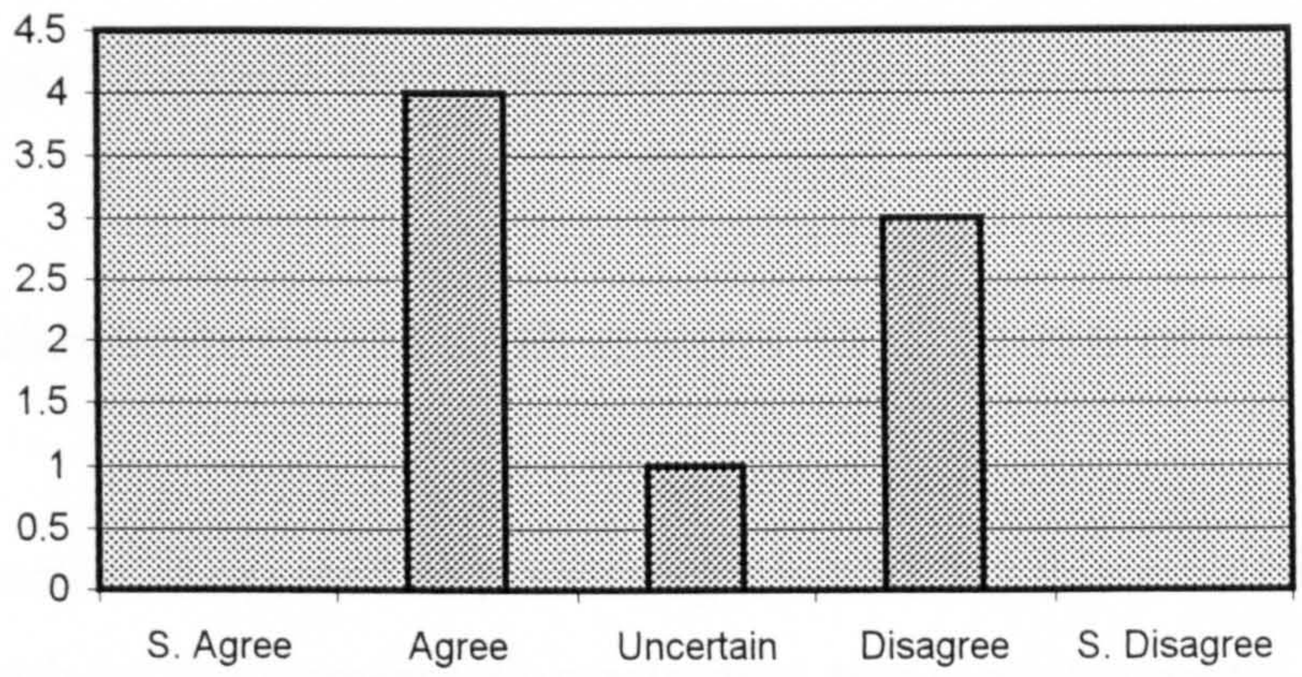

Figure 07 ALT creates the base to encourage other students' feedback

3.1.1.4 ALT allows students to organise their presentation

Students were directed to utilise the ALT's framework during the presentation, the discussion, and replication sessions. During the presentation and discussion sessions, most students did not use the framework by name, but the essence of it was there. As a result, their attitudes during these sessions were different, and could be divided into different categories. The first one, determined the main aspect as the start point, and organized the presentation around that, and directed other students feedback and comments toward that direction. For example, Mk said in his presentation session:

> *"I . . began by trying to work on the basis that the building itself could be a reference to the temporary nature of the fairground."*

Another group organised their presentation according to the idea of generation, the way they determined the departure point, and developed the concept; therefore, this approach is wider than the previous one. The third group conducted their presentation by justifying the design decisions, whereby the student rationalised the design process by creating a sequence that explained the process and presented it in a reasonable manner. The last group organised their presentation according to how they utilised precedent(s).

On the other hand during the replication sessions, and because students presented their analysis of other students works, all of them utilised the provided framework as means to organise their presentation and convince others of their analyses.

3.1.2 ALT provides students with means to discuss others' works

As the preceding section is devoted to presenting what ALT's framework provide students with for their presentation activities, this section aims to complete the second part related to how other students discuss the presented works. In this part all students agreed that the ALT's framework provided them with that means to discuss others' works. Deconstructing design process into stages invites the listener to conduct meaningful discussions with the presenter and to identify the main aspects the discussion should concentrate on. In addition, it also allows the presenter to control the discussion session (Figure 08).

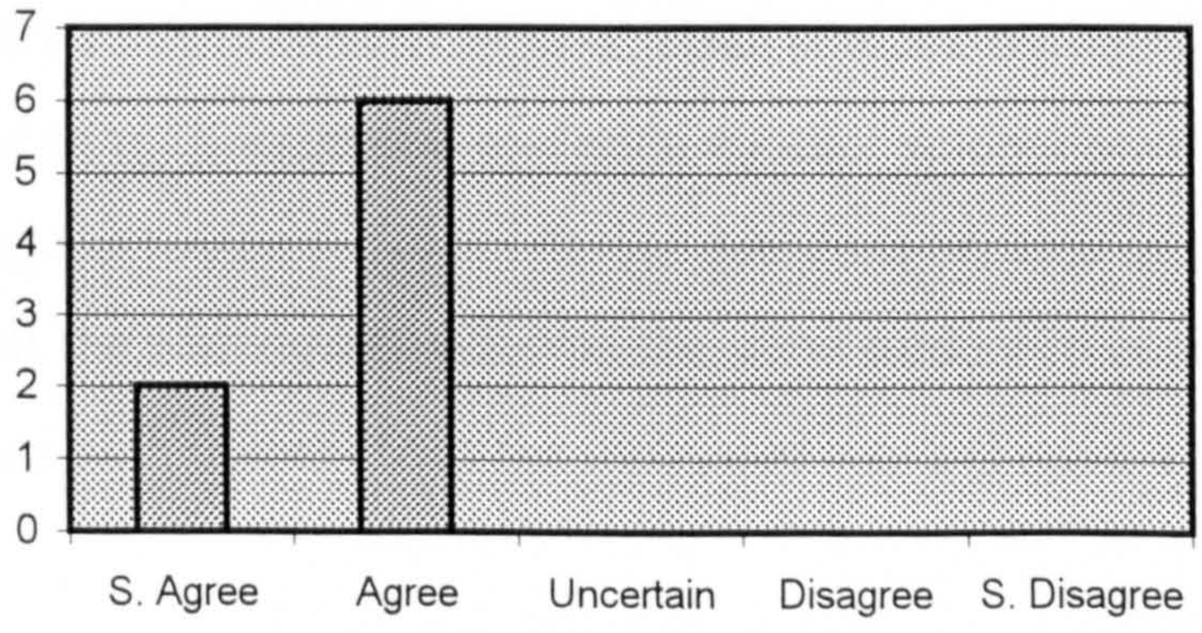

Figure 08 Provides students with new means for discussing their works with others.

3.1.2.1 ALT provides students with a skill for analysing others works:

ALT not only provides students with the opportunities to discuss others' work, but it also provides them with the means to analyse it. Deconstructing design action into the four activities not only directed the discussion toward the main aspects and the critical sides, but also allowed students to analyse other students' work. This analytical skill was utilised during the replication activity, in which each student tried to extract the essence of another student's work in order to re-design the same project in the following stage (Figure 09).

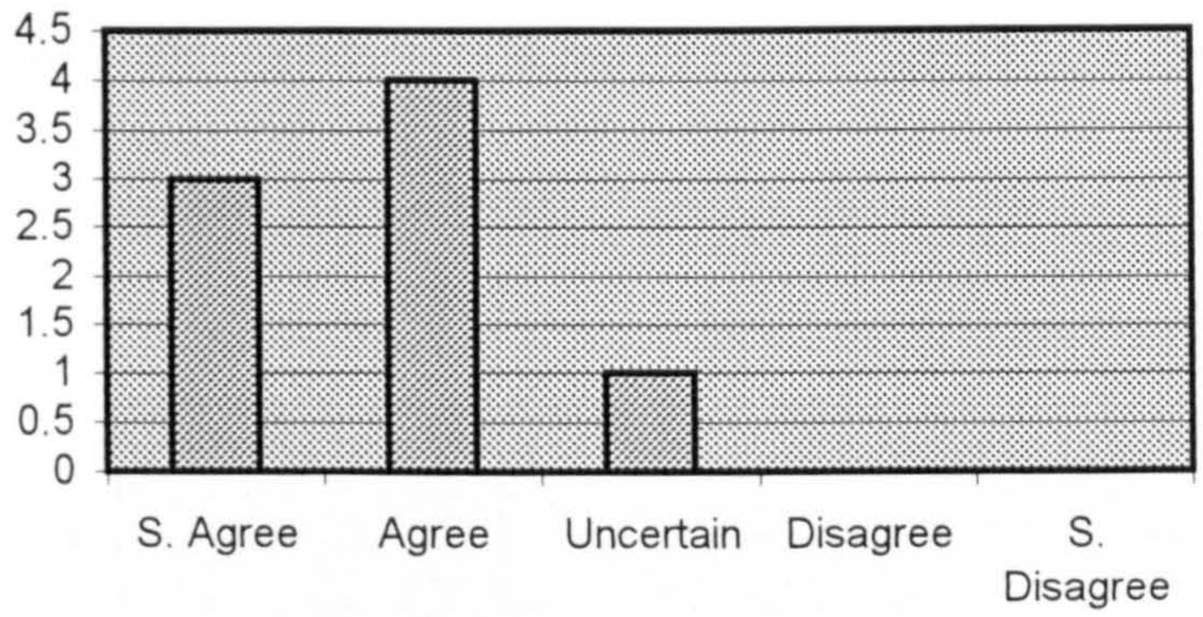

Figure 09 ALT provides students with a skill for analysing others' works

3.1.2.2 ALT allows students to identify the reason behind many design decisions:

To discuss and re-present other students' design work one has to extract the reason behind each design decision. The replication activity creates a unique opportunity to identify such aspects. Each student, during the design experiment, was asked to re- present and re-design another student's works; therefore identifying the reason for many design decisions became essential (Figure 10). As a result the activity also allowed the same student to conduct meaningful discussions with others about the replicated work (Figure 11).

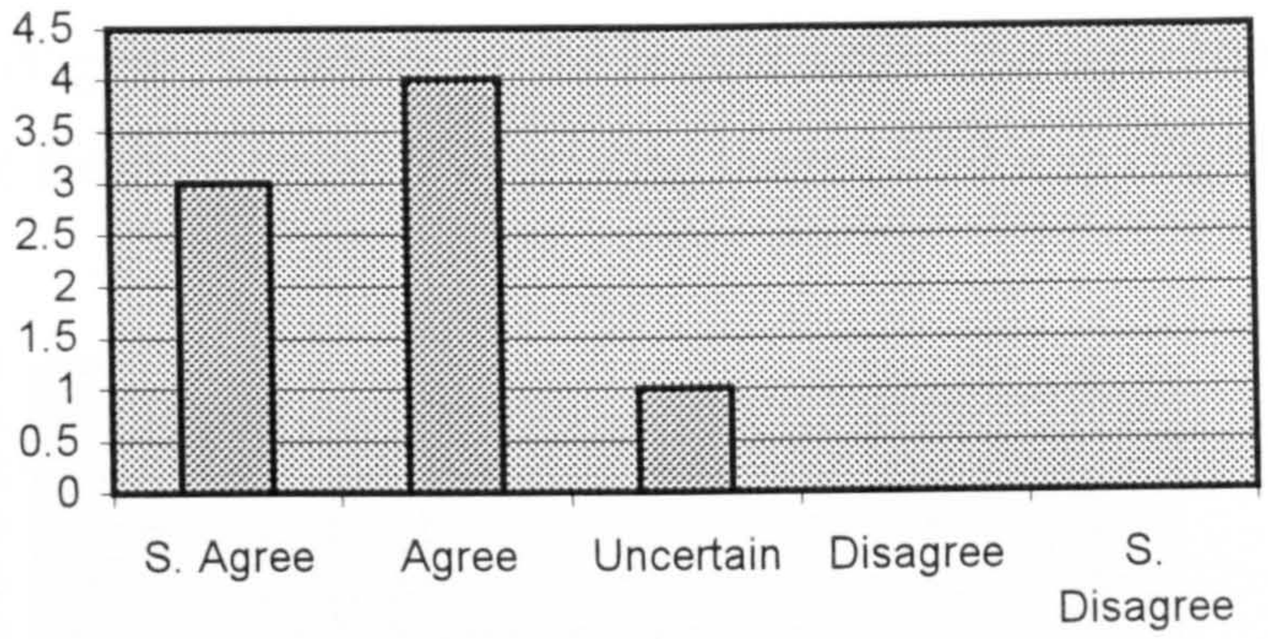

Figure 10 ALT allows students to identify the reason behind many design decisions

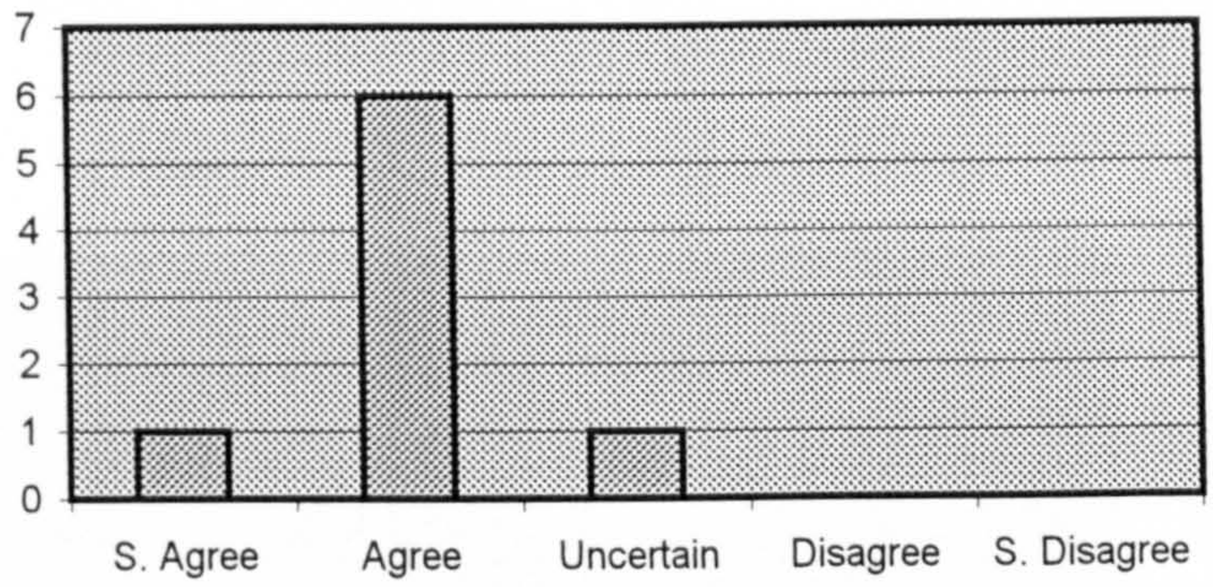

Figure 11 Provides students with new means for re-presenting others' works.

3.1.2.3 ALT allows students to draw the map of other's design process:

To establish a meaningful discussion, the students try to draw a map of others' design processes in order to understand their design practice and direct their discussions. To draw such mental image, student has to identify and highlight the components of the required map in order to compose it. There are two activities students get involved in to draw the line of thought. The first one is during the presentation and discussion activities, in which a student presents his/her design work to another student, and the second activity occurs when the second student replicates the design process of the first student, and presents it in a form of replication report. There are significant differences in the students' feedback about how the two actions help them to draw such mental map. In the

first action, the most of the listeners stated that the activity helped them to draw the required map (Figure 12), where as, the second action, the replication, was judged not helpful for most students in drawing the required map (Figure 13).

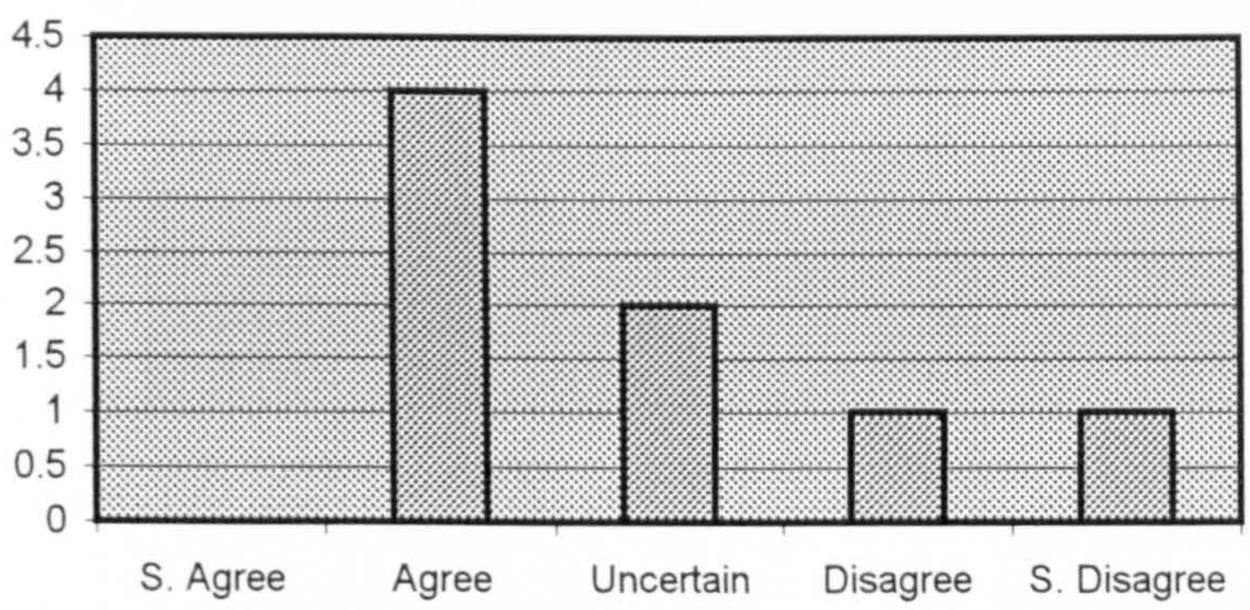

Figure 12 ALT allows students to draw the map of others' design processes

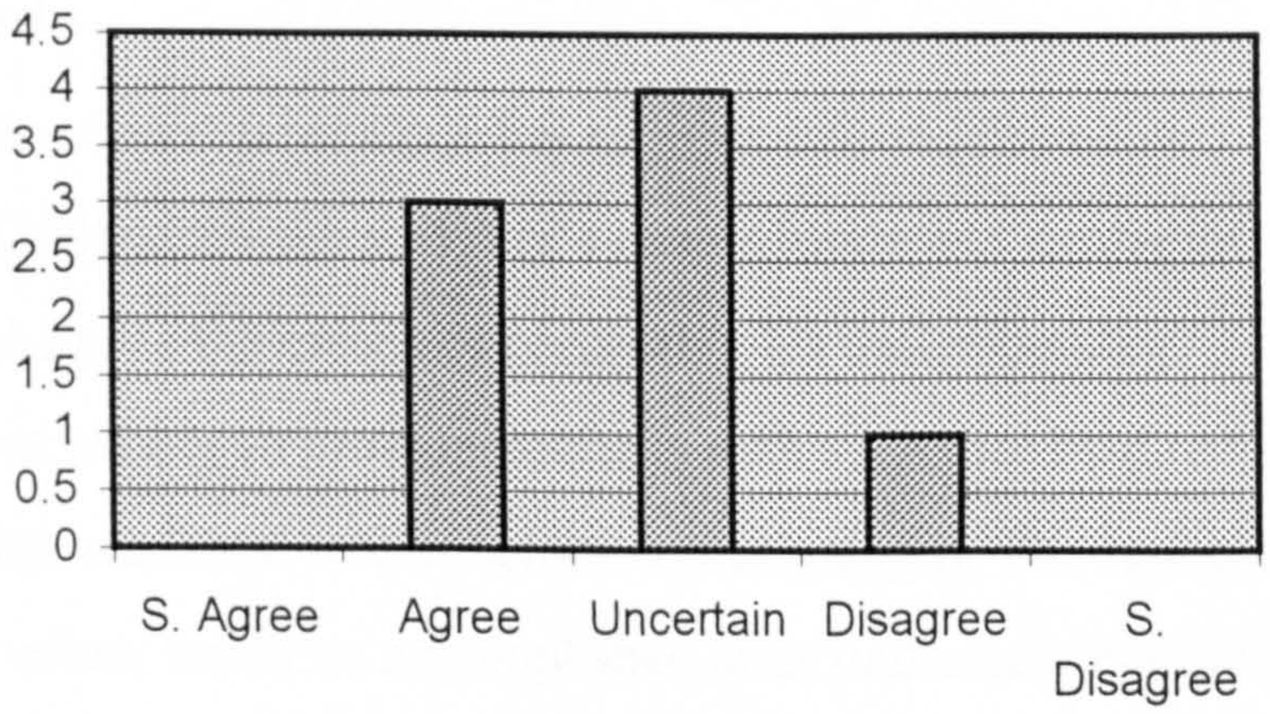

Figure 13 Drawing other students' lines of thought

3.1.2.4 ALT provides students with means to discuss other students' works:

The new tool allows students to build a base for communication and discussion among themselves, with the possibility of enhancing the discussion if the participants understand one another. From the observed sessions in the design experiment, and the recorded interviews the students agreed that the new tool allowed them to discuss others' works in meaningful way, to direct the

discussions toward relevant issues, and to concentrate on the process of generating idea more than the end product (Figure 14).

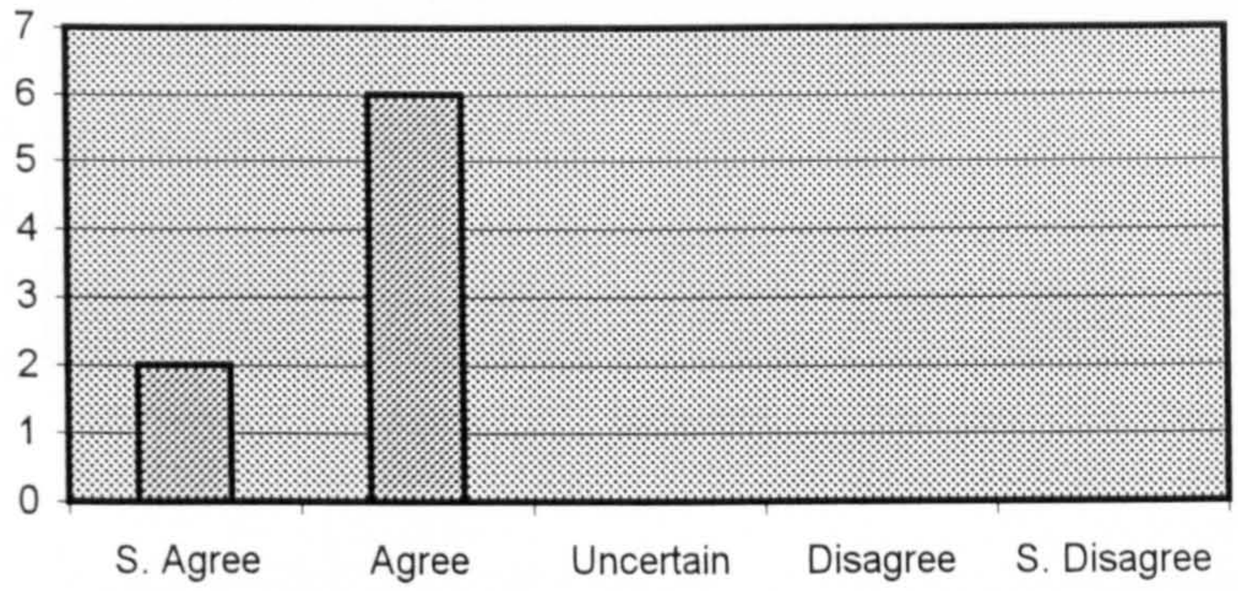

Figure 14 ALT provides students with means to discuss other students' works

3.1.2.5 ALT allows students to acquire the ability to re-present others' works

To re-present others' works one has to meet two requirements:

- Understand the designer's design mode and strategies;
- Acquire the means of presenting his understanding.

The ALT was aiming to provide students with such tool by directing them to replicate other students' works before re-designing it. The replication process, as mentioned before, could be accomplished after understanding the design process and the way the designer conducted such action. In addition, student has to present it as it occurred to allow the designer to clarify any aspect that was misunderstood or misinterpreted, which would result in identifying the strong and weak sides of the designer's practice. This means encouraged students to be more critical in their presentation and to concentrate on the process more than the product (Figure 15).

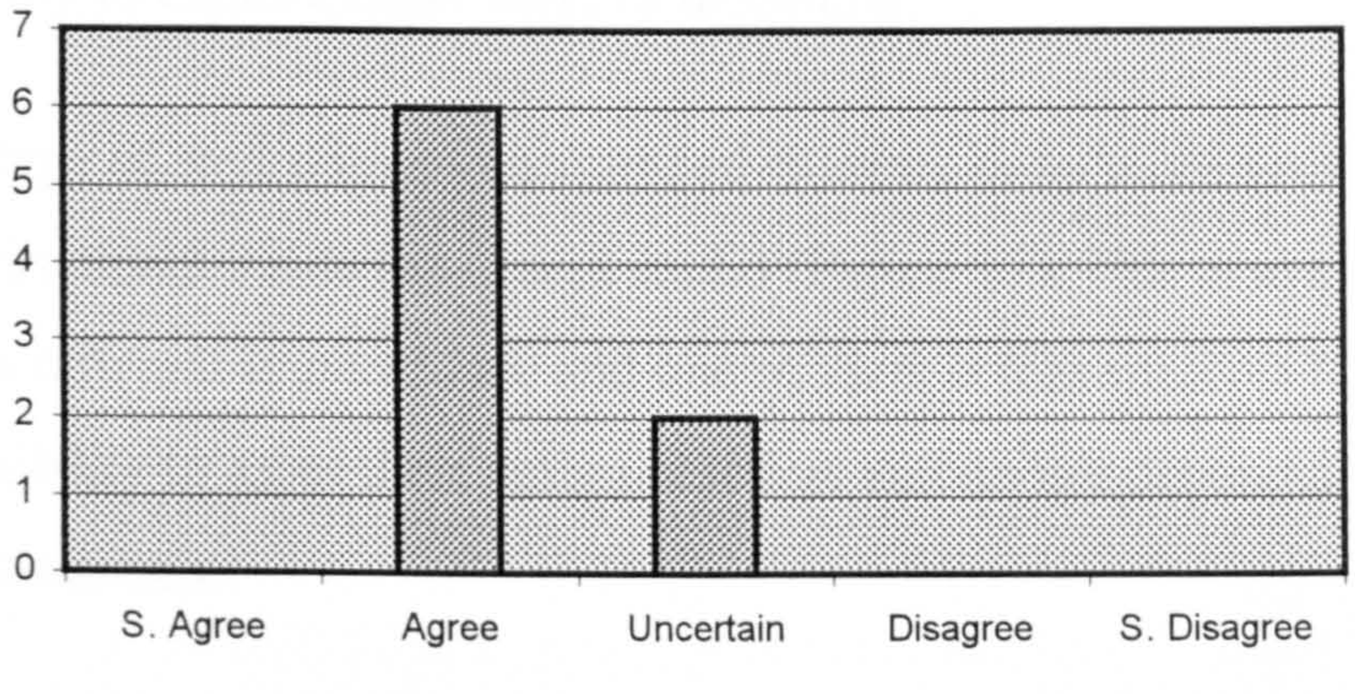

Figure 15 ALT allows students to acquire the abilities to re-present others' work

3.2 ALT as assessment tool

3.2.1 ALT providing students with the means to asses their design practice

As ALT aims to develop the students design practice, the assessment of this practice is considered to be the first step toward improving the condition of their practice. From the assessment, students can identify first the strong features of their design practice so they can concentrate on these aspects during their future practice in order to improve the end product; then, the weak features also, and direct their attention towards them during the future design practice for improvement.

Furthermore, ALT allows students to identify other aspects related to their the design practice, such as identifying the missed opportunities and the design approaches that have been overlooked and therefore not fully investigated.

In general, this assessment tool allows students to look at their design practice from different perspectives, which at the end enables them to identify many aspects related to their design practice (Figure 16).

For example, Vi assessed his performance during the ALT exercise, and commented:

> *". . . I think it's just an experience and it's quite good, it's fun, but as whether it's really useful or not, I'm not sure. I'm not sure whether I*

> *benefit a lot from it but it's kind of an interesting way; it gives me an opportunity to explore other ways of designing. . . "*

In general, this type of environment encouraged students to be more active in the learning environment inside the design studio (Figure 17). This active participation has different implications, and one of them is that students take over the responsibility to asses their design practice, and do not depend on the design tutor's assessment.

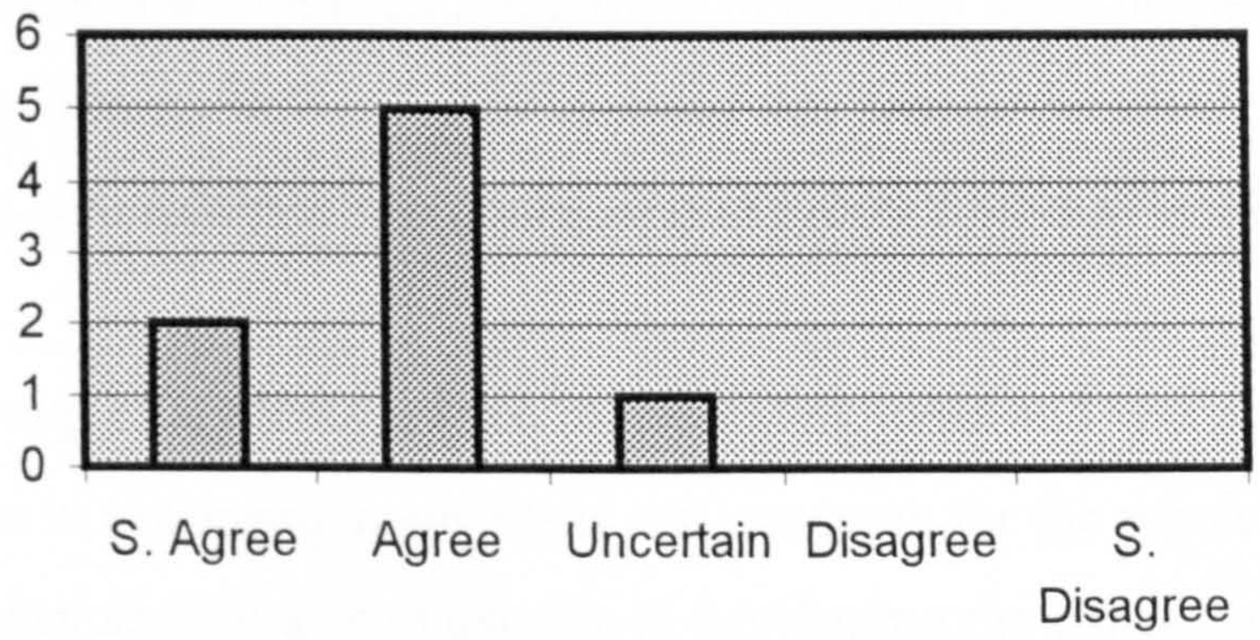

Figure 16 ALT provides students with means to assess their design practice

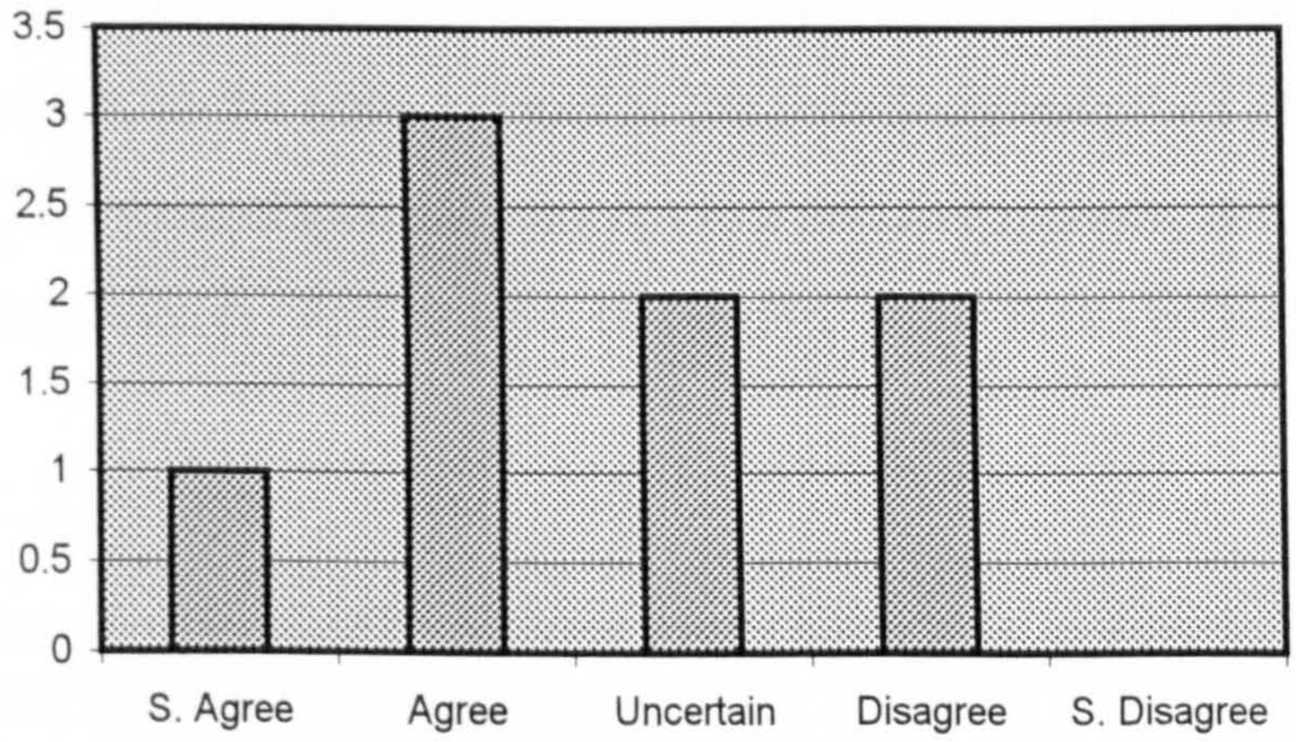

Figure 17 The new design practice encourages students to be more active.

3.2.2 Student has to know his/her design mode

From the design presentations and the observation of the re-designing sessions, it has been noticed that students' design modes could be divided into two categories:

1- Concept Generator;
2- Concept Developer.

Students from the first category tended to generate new ideas more easily, and faster than those in the other type. But the stage of exchanging one's project with another student's and developing other students' scheme in the new site was not an easy task for this type of students. In fact one student from this category was not able to complete the project. For this group, the ALT project concentrated only on the conceptual stage, in which it allowed students to generate many concepts without requiring them to develop them farther. As Lu stated at the group interview: *". . I quite enjoyed this project because . . I had the opportunity to generate just two concepts and I didn't have to work them out."*

Therefore, this group of students is keen in generating ideas and was able to spend a lot of time in proposing many ideas and concepts for the whole building or part of it, but they are not as enthusiastic in developing the concepts to the end.

The second group is at the opposite end. They got stuck at the beginning of the conceptual stage and produced a weak design concept; but during the stage of re-designing the project, in the same manner as the first designers, their attitude was very different. They developed the concept in a decisive manner, and their end products were distinctive. As Ca, from this group, put it at the individual interview:

> *". . . I'm not very good at generating ideas but it was so easy to do someone else's project, . . . "*

Of course there is a third group midway between the two design modes, and wherein students can generate good ideas and develop them farther, to a reasonable level.

The implication of categorizing students according to the design mode is that it could help the student know his/her design mode for him/her to try and develop this mode as well as improve the condition of the design practice whatever the design mode.

3.2.3 ALT provides students with the means to assess others' design practice

ALT allows students not only to assess their design practice, but also for most of them to asses other students' works through the process of exchange and re-design activities (Figure 18). These assessment activities could cover different aspects such as how other students tackled the design problem, how they chose the departure point, and how they identified the main aspects and framed them and generally assessing the whole process.

This assessment activity could also cover specific aspects such as: identifying the missed opportunities (Figure 19), and the overlooked design approaches while the identification was being captured in the observation sessions, and students were not very clear about it in finalising their decisions (Figure 20).

Ge stated at the replication session how he identified the missed opportunities:

> *". . .I think like[other student] said, she regretted having to kind of reject the kind of iconic forms because of the lack of time . . but I think it was perhaps a missed opportunity that they had to be put aside to bring this thing to a kind of a presentation level."*

At the replication stage another students, Ja, identified how other students lost the essence of their main idea by the end of the process, and observed:

> *". . . I thought that was really a strong sort of an idea, but then I think the idea has been some how lost. . . "*

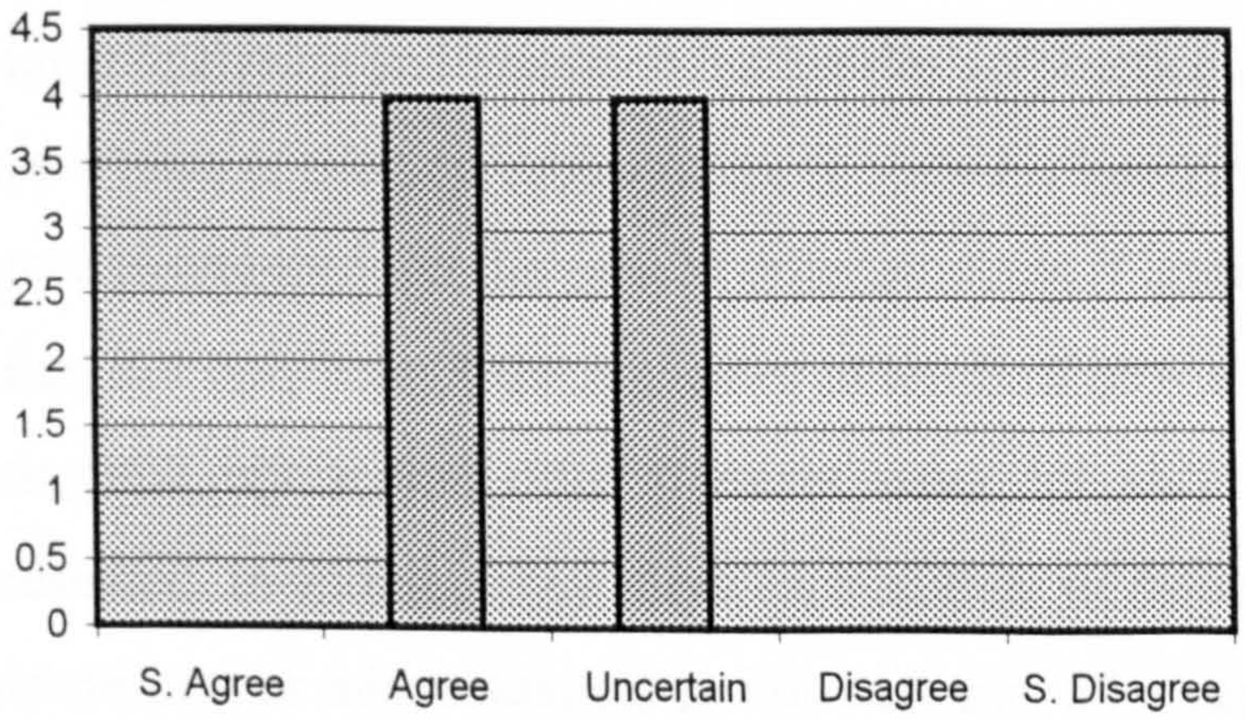

Figure 18 Assessing others' design practice.

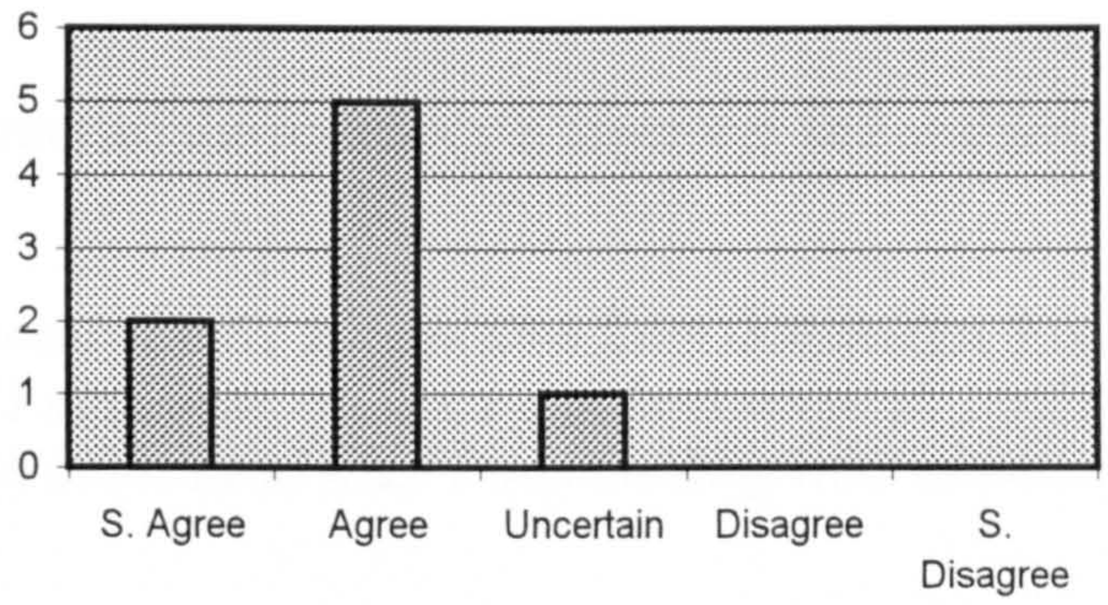

Figure 19 Identifying the missed opportunities.

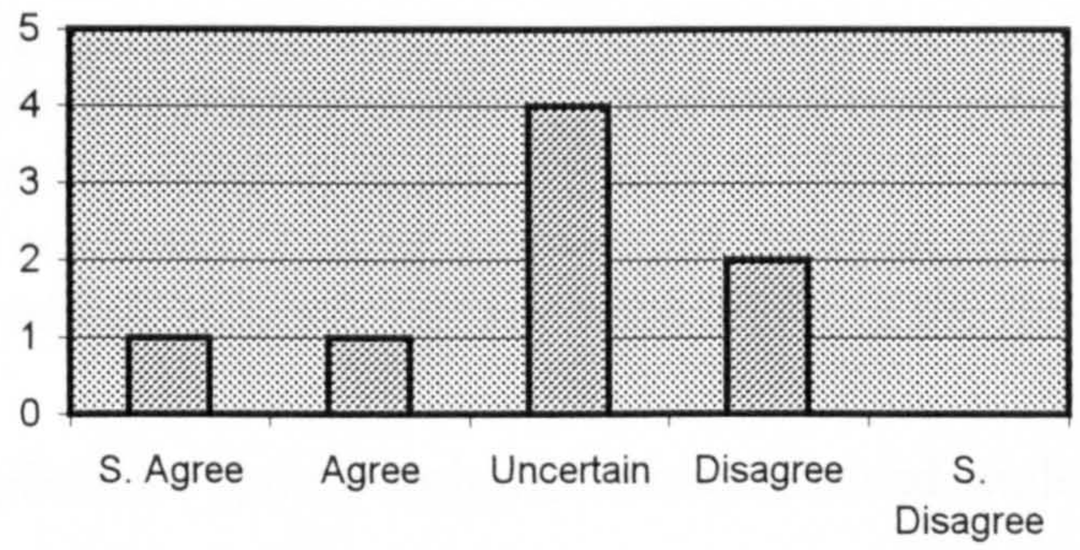

Figure 20 Identifying the overlooked design approaches.

3.2.4 ALT allows students to view their design practice from different perspectives

During the replication and re-designing sessions, each student had the chance to listen to other student analysing and assessing his/her design practice and process. These opportunities allowed each student to view his/her own practice from a new perspective and through the eyes of other students (Figure 21). The replication activities, not only benefit the replicator in terms of how to acquire the skill of analysing and representing other students' work, but also the students whose work is presented. In addition they allow each student to defend his/her work if others misinterpret or misunderstand it. For example, after hearing from Mk, the replicator student, the designer, De, responded: "*yes, I see what you*

mean . . but no sorry, I didn't think about that at all when I was actually doing it."

One student, Ca, supported the replicator's, argument and analysis, and said:

> *". . .but obviously I have got the idea from that design, I mean the clear idea for and I now know, oh yes, I did think about it; yes I think he's got it pretty much in the head what I was thinking a lot about,. . "*

Another student, Ja, supported the argument that replication action allows students to view their design practice from different perspectives and claimed, at the individual interview, that:

> *"it's . . yes its quite interesting to sort of see it from outside . . . ., something else, like when you disengage from it and then someone else tells you what they think of it, and try kind of identify whether that was the case and see how it's come across; and then you realise things did happen in a certain way without you realising it at the time . . "*

In general, as the replication and re-design activities allowed students to be active in their presentations, they also allowed them to be critical in their response, and to clarify any aspects that may need clarification.

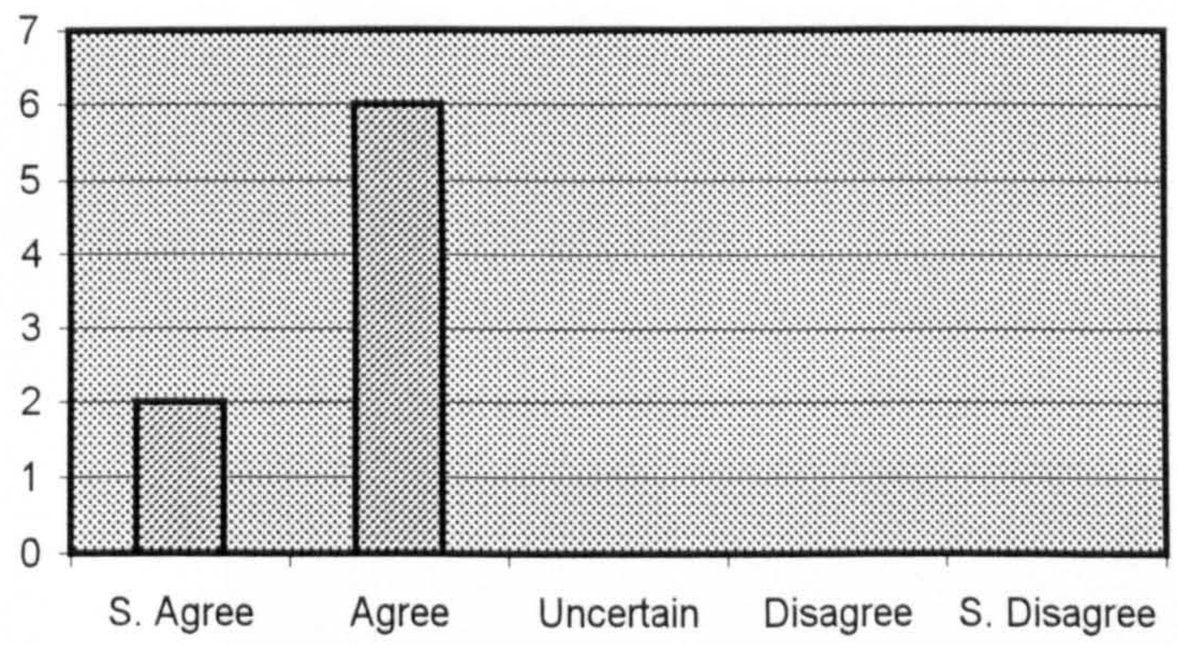

Figure 21 Students looking at their own design practice from different perspectives.

3.3 Means for enhancing students' design practice

As ALT aims to improve and develop students' design practice, it can also be seen that students were able to acquire other skills. These skills enabled them to enhance their design practice, and improved their designing in a professional manner.

3.3.1 Precedent as agent for inspiring idea generation and enhancing design process

The precedent, as part of students' repertoire (Schon 1983) and frame of reference (Hertzberger 1991), was utilised by students during the design process, and its significant role in enhancing students' design process and inspiring their ideas generation and concept development was identified (Figure 22) (Figure 23).

Therefore, this section sets out to present this role from different perspectives, in order to highlight its importance in the process of developing students' design practice, and its potential in the design studio practice, provided that the design tutor pay attention to it.

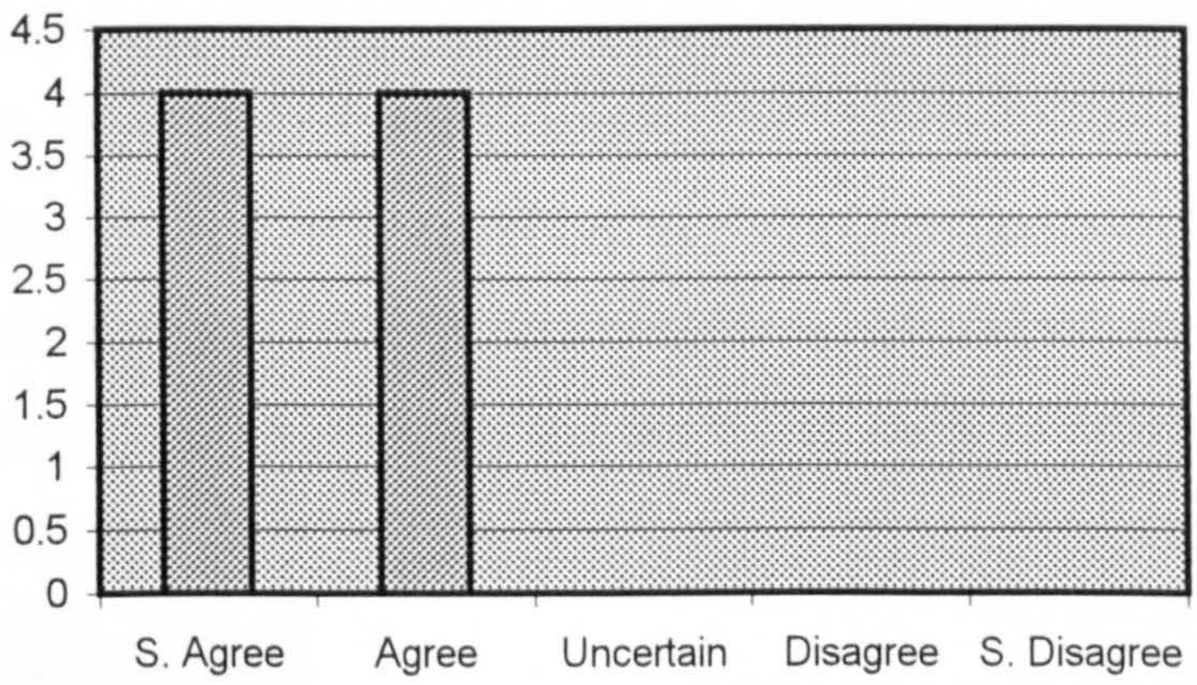

Figure 22 Generating design ideas.

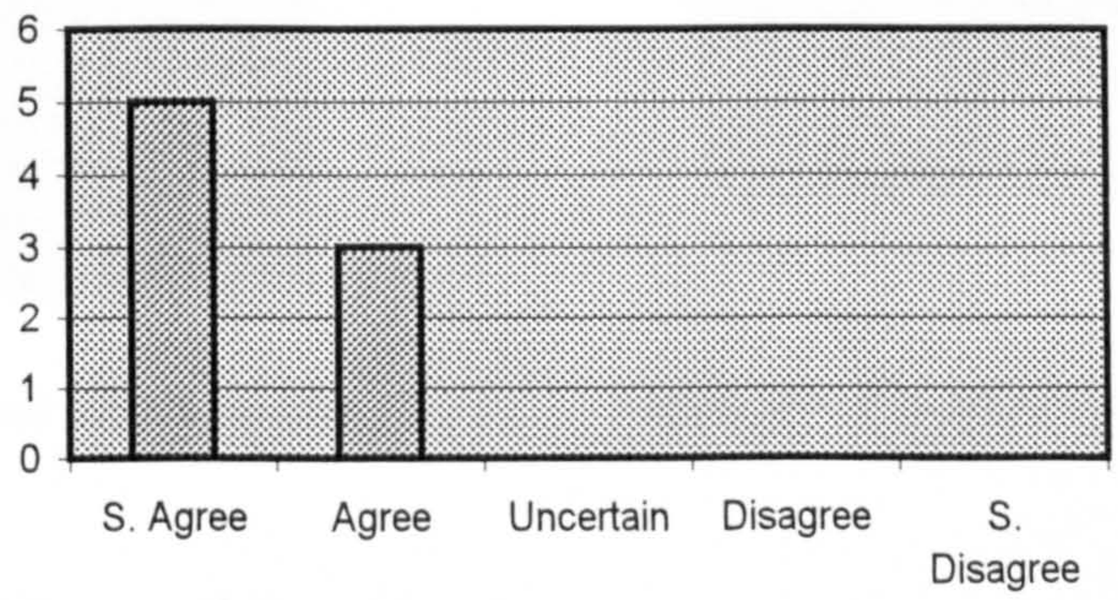

Figure 23 Expanding student's frame of reference.

3.3.1.1 Types of Precedent

According to students' presentations and replication sessions, most of the students utilised and adapted different types of precedents in their design process. These precedents could be categorized into two types: architectural and non-architectural precedents (Goldschmidt 1987).

3.3.1.1.1 Architectural Precedents

This type of precedent refers to the architectural elements that students adopted and utilised in their design practice. These elements may include: a building form of Barcelona Pavilion (Figure 24), Millennium Dome, and the Knowledge Zone at the Millennium Dome (Figure 25). Students adopted these precedents not only as a building form, but also as a mode of arranging the building elements. In addition to that, other students adopted the essence of the precedent, i.e. a specific issue in the project, like the circulation pattern of one of the Steven Holl buildings, or the minimalism aspect of Mies buildings. Some other students also adopted the precedent either as a whole or partially, like the idea of inflatable roof structure of the Austrian Pavilion. Therefore, students adopted different architectural precedents, and dealt with them in different format and design modes.

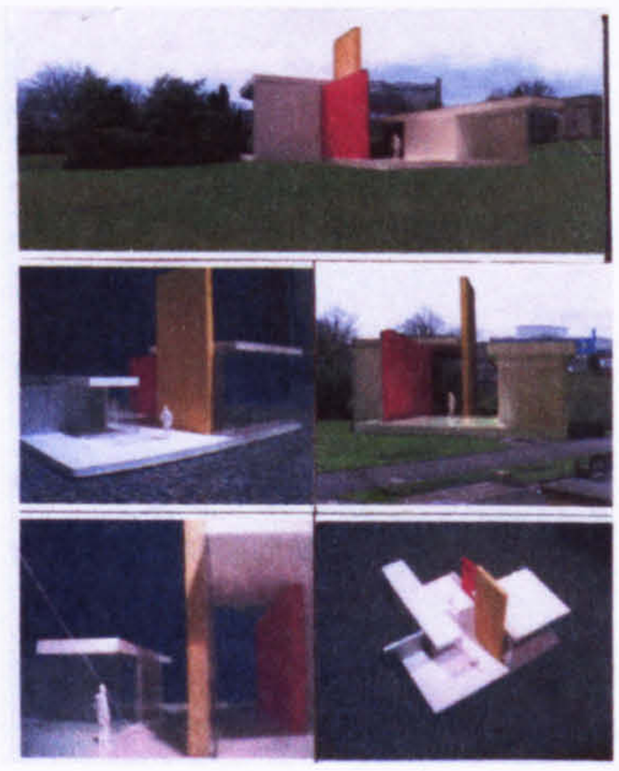

Figure 24 De's project and Mies's essence

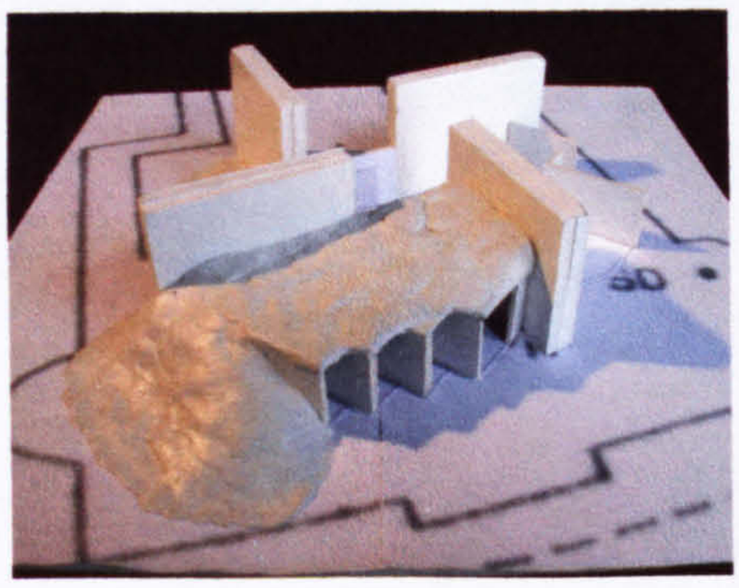

Figure 25 Ja's project and T.V. walls

3.3.1.1.2 Non-Architectural Precedents

In the same way they utilised architectural precedents during their design process, students also utilised non-architectural precedents. These elements

worked as an inspirational agent for the idea generation at the beginning of the design process.

The most influential element was the icon of the fairground (Figure 26), a mental image that inspired some students to consider the project as temporary (Figure 27), or to adopt different elements in the fairground such as the roller coaster, colour tent, merry-go round, helter-skelter, Joy Ride, and other elements as a reference to the fairground (figure 28) (figure 29) (figure 30).

The students were different in their use of this type of precedents; some of them adopted the element directly, without any major modification, while others exploited its essence. Other students tried to re-create the real experience of the fairground for the project's visitors, and tried to mimic the colourful mental images of such experience in real life (figure 31).

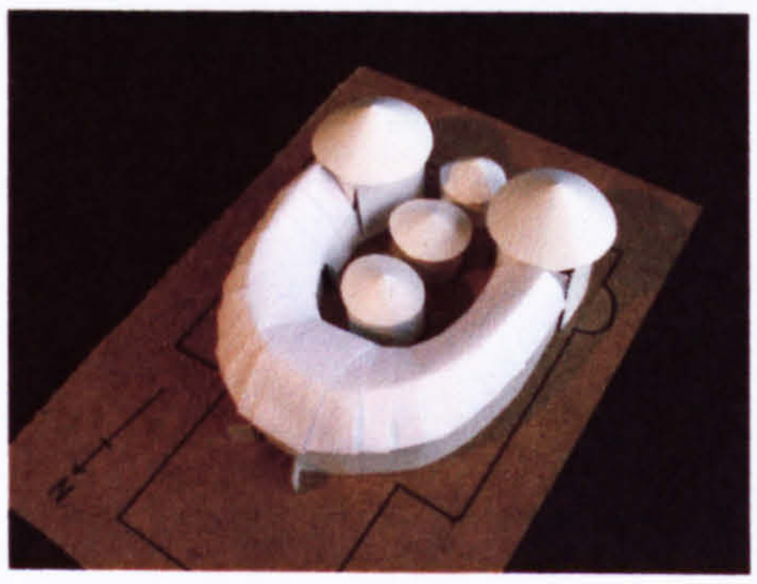

Figure 26 Ca's project and fairground appearance

Figure 27 Mk's project and fluid nature

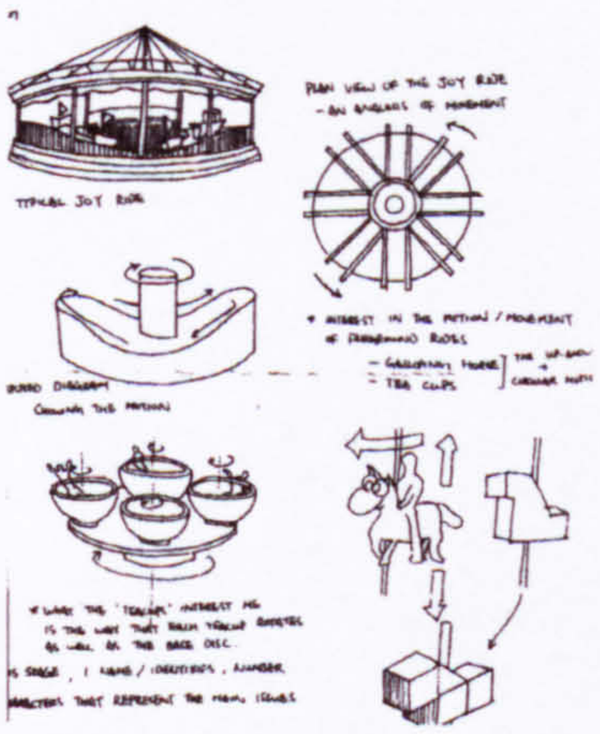

Figure 28 Fairground rides as non-architectural precedent

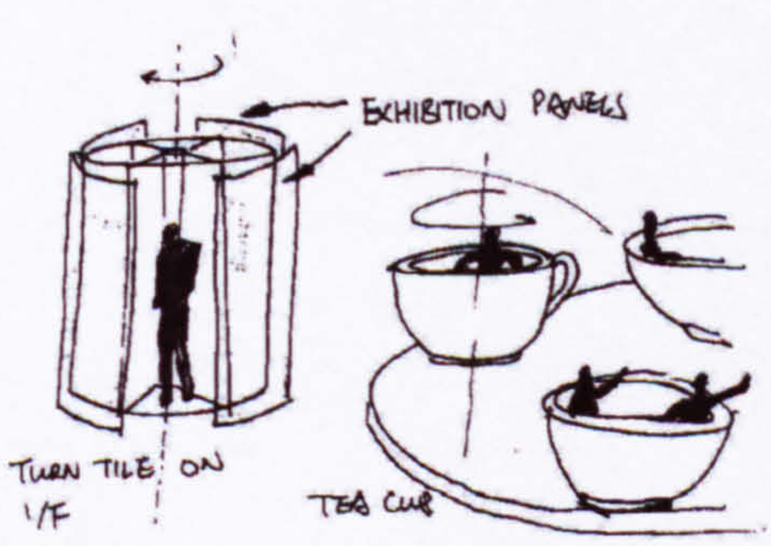

Figure 29 Fairground rides as non-architectural precedent

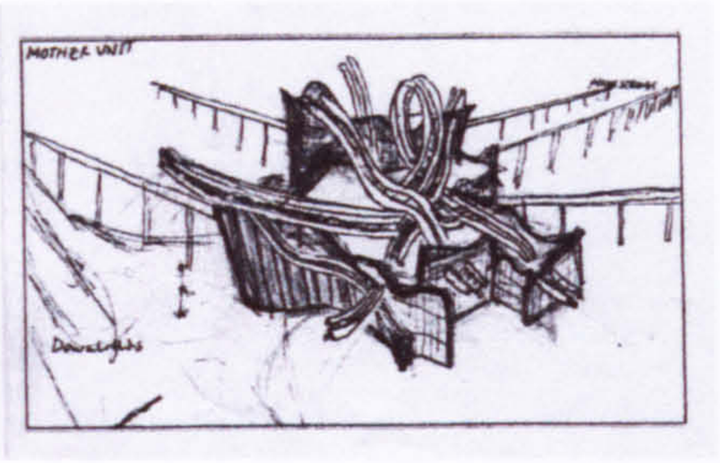

Figure 30 Lu's project and Roller Coaster involvement as roof element

Figure 31 Ms's project and mimicking the colourful mental image of the fairground experience

3.3.1.2 Sources of Precedents

As precedents are of different types, students could obtain them from different resources. From the research findings it has been noticed that students acquired the precedents from three main sources.

A. Practitioners' Works

These are the main sources and the most influential. Students usually refer to the well-known architects' projects and buildings as the main source of inspiration, Mies buildings, Steven Holl buildings, and other building like the Millennium Dome and others are such examples.

B. Students' own works

In the same way some students utilised famous architects' buildings and project as the main sources for the precedents, other students took advantage of the ALT project to use their own prior design experiences as a means of reflection upon their work and a tool to asses it (Figure 32).

C. Other students' design experience

The last source from which students acquired their precedents is other students' design experiences, in which some students considered the ALT project as a good opportunity to test other students' designs mode and approach (figure 33). This was the reason given by this student, Vi, who put it this way:

> *". . . .I was quite interested in the way that he [other student] does it, so . . I just wanted to give myself a try and see what it's like, how it feels like to be in his place, so that's why I kind of copied a bit of his idea and tried to work it out in my fashion."*

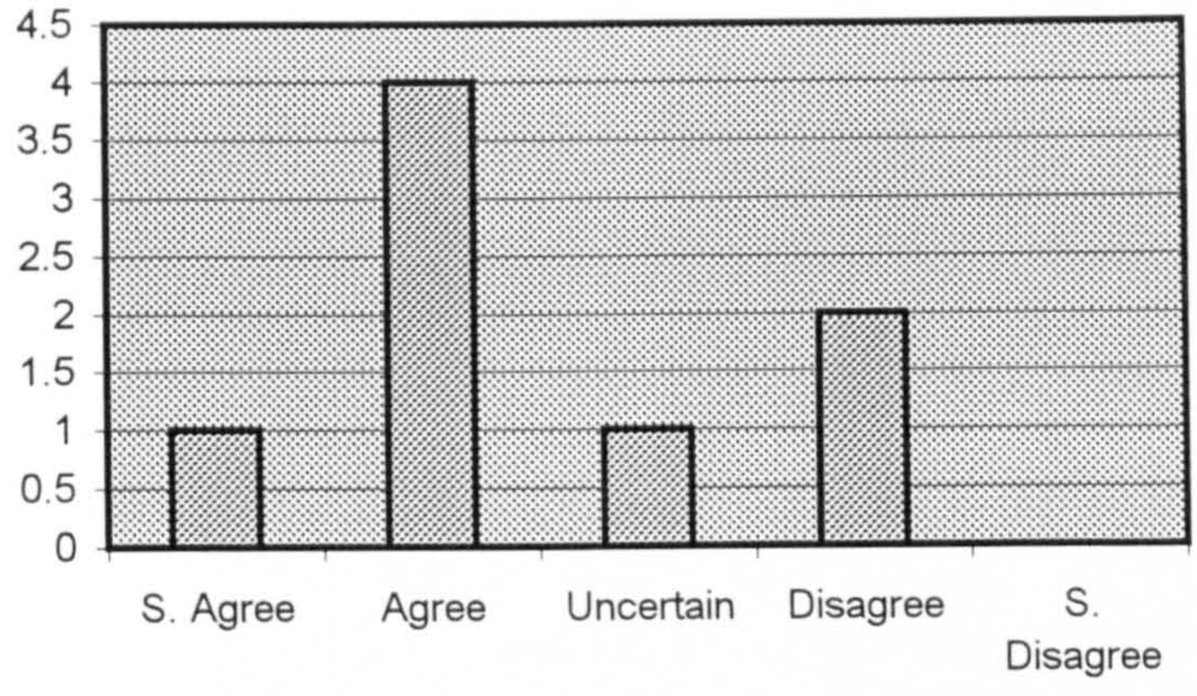

Figure 32 Students utilise the new tool to reflect upon their prior design experience.

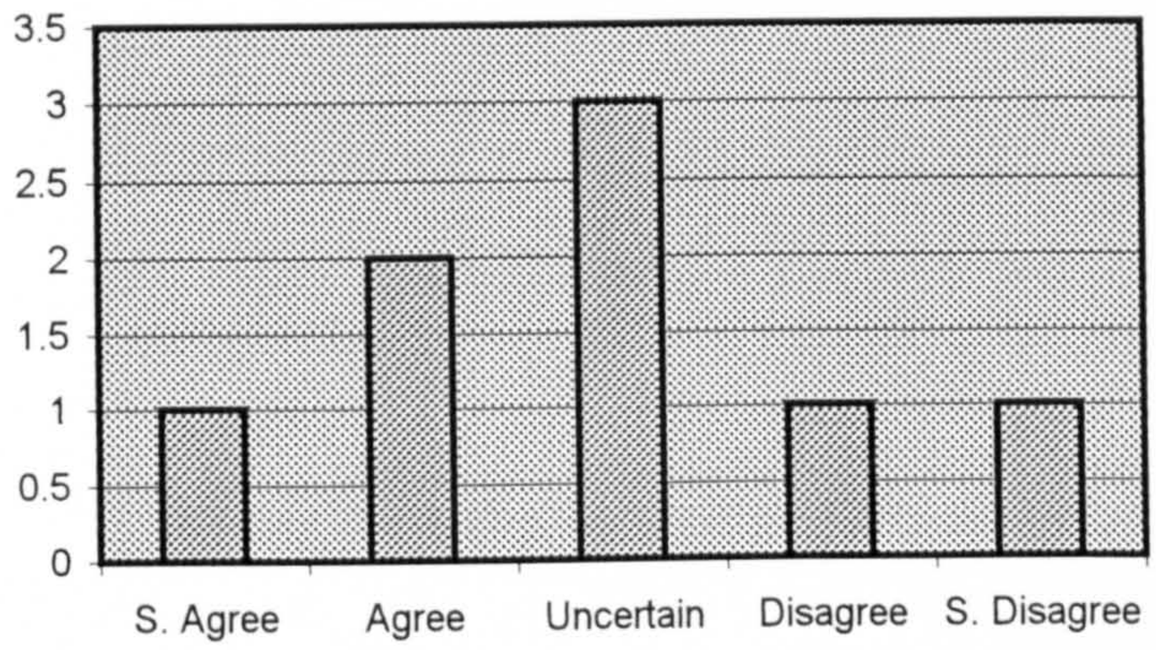

Figure 33 Experiencing the design mode of the other designer.

3.3.1.3 Students' attitude in utilising the precedents

In relation to the usage of the precedent, and how students utilised them in the design experiment, the students' attitude could be divided into three categories.

3.3.1.3.1 Dealing with the precedent unconsciously

With this category, the precedents become embedded in the designer's memory and become as a part of his tacit knowledge; and when the need for such knowledge arises the precedent is recalled and utilised unconsciously. In the experiment this type of student utilised the essence of the precedent only unconsciously, and without identifying the source. But even if they were reminded of it they would deny the relationship, and come up with a reasonable rationalisation (Goldschmidt 1994). In fact, the students were telling the truth,

because the involvement of the precedents was not with the physical form, but with the essence only (Figure 34). As De stated:

> *". . . she thought I was trying to put the Miesian building into my own design; actually I find out it looks quite a bit like the Barcelona pavilion after I have built the model. So it's not come as a precedent actually."*

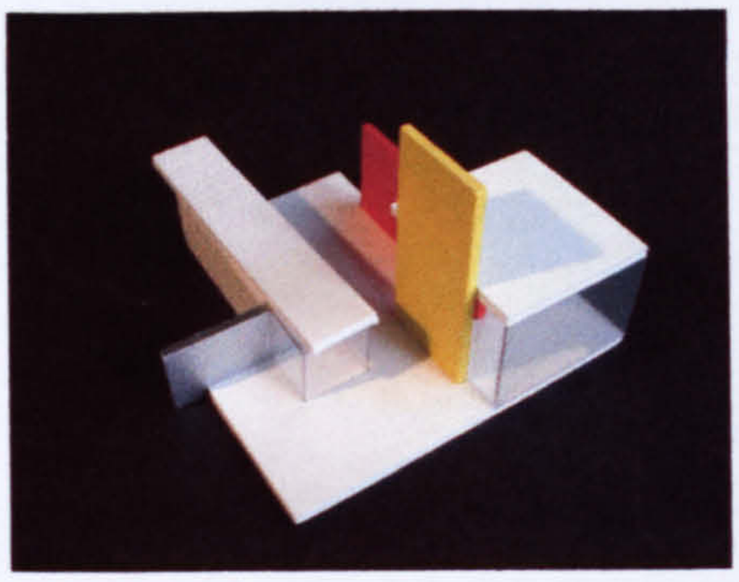

Figure 34 De's project and Mies's essence

3.3.1.3.2 Introducing the precedent at the initial stage

The students in this category introduced the precedent at the conceptual stage, where it acted as source of inspiration for the design concept. On some occasions, these precedents dominated the design process, and they not only provided students with the starting point for the design process, but they also guided them through the entire process. As a result, the end product mimicked, or resembled, the precedent. At other times, only the essence of the precedent existed and the students confirmed that, but the precedent did not dominate the process.

Consider this student from the first group, and the way he introduced a non-architectural precedent at the beginning of the design process. The precedent dominated the whole design process. Lu stated:

> *". . .I think I started work on the idea of a roller coaster because I thought about what a fairground means to me, and the most important thing for me on a fairground is the roller coaster; otherwise for me it is not a proper fairground, . . "*

Another student, Mk, from the second type who introduced the precedent at the conceptual stage, and adopted the essence of this precedent (Figure 35), said:

> *". . . I was looking at the sort of obvious membrane and tent like structures that they employed, but trying to create anything like the millennium dome or anything like that; so I quite quickly came up with the analogy of the fairground as this fluid or sort of metaphor . . . "*

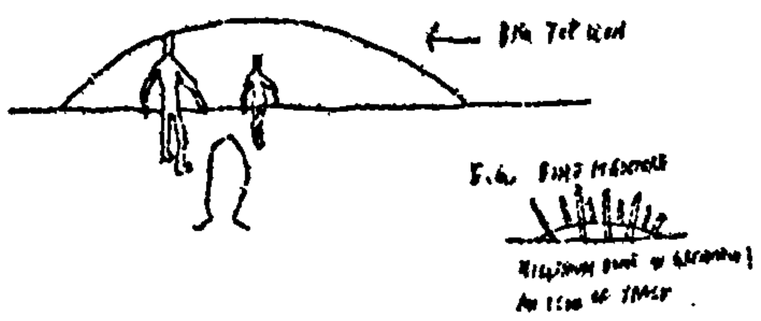

Figure 35 Millennium dome precedent for Mk's project

3.3.1.3.3 Introducing the precedent at the development stage

This group of students commenced their design practice with or without involving any specific precedent at the initial stage, but during the development stages and when they encountered sub-problems, they utilised and introduced new precedents that helped them to resolve the problem. Students considered the precedents as a pre-test or pre-made design solution created by other designers. So they are ready-made solution for direct usage, which at the end helped students to tackle the problem in a professional manner.

A student, Lu, who utilised one precedent at the beginning, but encountered a roof problem, introduced another precedent, which helped him at that stage. He said:

> *"Another precedent I actually only introduced at that time when I thought of what's the roof going to be made of, was first I thought of a straight glass roof and then I remembered the precedent Eric Moss's design . . . "*

3.3.1.4 Precedent and Idea realisation

During the conceptual stage of the design process, some students can easily generate ideas but cannot realise and convert them into architectural formats, so the precedent helps them during such activity. One student had an idea that the building of the fairground should open in the day and close at night, but he was

not able to realise this idea and convert it, until he came across the image of the Austrian Pavilion with the inflatable roof structure. At that moment the student was able to realise the idea and present it in architectural form.

3.3.1.5 The stage at which the precedent gets involved

Based on the Reflective Practice Theory which deconstructs the design act into four activities: naming, framing, moving, and reflecting; and based on the research findings, it has been noticed that the involvement of the precedent occurred during the first three stages. The research findings did not investigate the involvement of the precedent in the reflection stage, but this researcher believes that the precedent could have a significant role because it could provide the designer with pre-tested design decisions.

At the naming stage, the precedent directed the designer's attention toward a specific aspect to be considered as the main aspect for such building type, like security or circulation. This type of involvement exposed students to other designers' experiences and allowed them to experience the importance of such aspect in the design process, and how this aspect could affect the entire design process.

On the other hand, at the framing stage, and after identification of the most important aspects in the student's opinion, students utilise a pre-test frame in order to tackle the design problem in a professional manner. That frame was used by other designers and was considered as the suitable frame for such aspect (Figure 36).

Finally, at the moving stage, and after having accomplished the first two stages without involving any precedents, students may try to mimic other designers' works by borrowing their design approach or their design solution, like the building form, and modify it to be suitable for the design problem in hand (Figure 37).

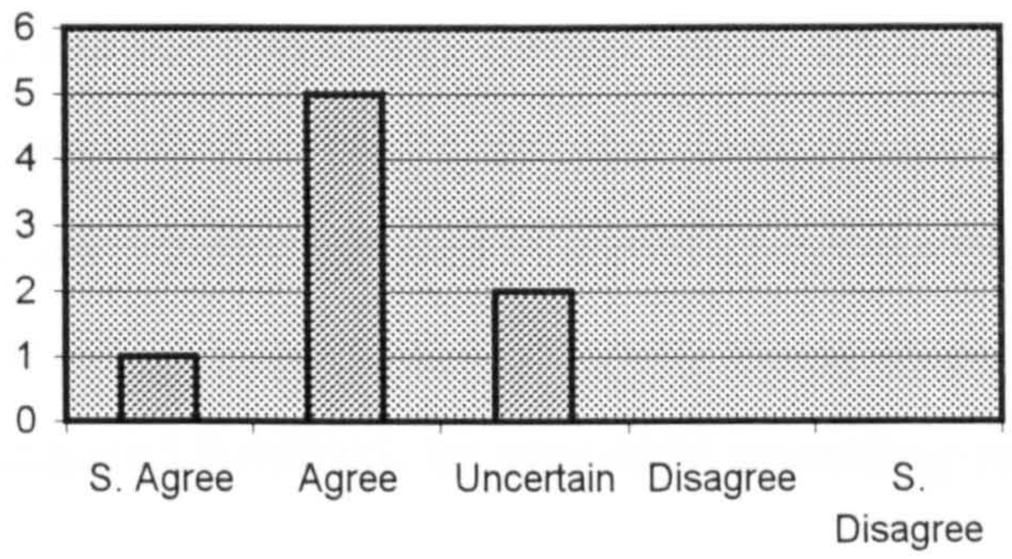

Figure 36 Enriching the design process by providing students with a ready-made design frame.

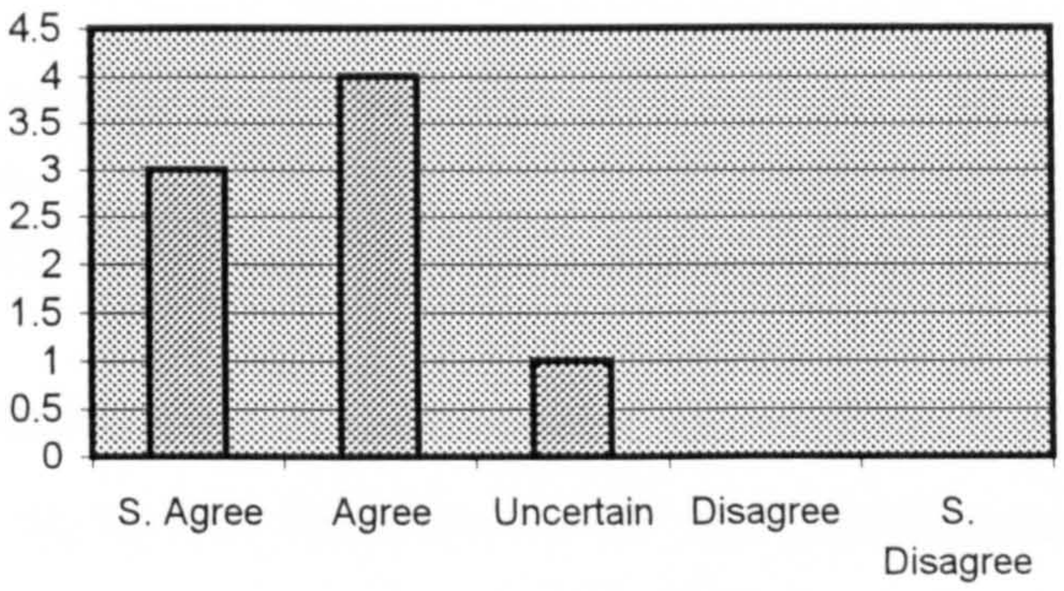

Figure 37 Enriching the design process by providing students with a ready-made design move.

3.3.2 Other Means for enhancing students' design practice

Besides identifying the importance and the role of the precedents in enhancing students' design practice, there are other means ALT provides students with for the same purpose. The three stages of the experiment, deconstructing the design process, replicating the design process of other students, and re-designing the project in the same manner as the first designer, provided students with different means that allowed them to improve their design practice.

3.3.2.1 Deconstructing the design process

This stage is considered part of the ALT sequences, but has multiple face implications on students' design practice, as it allows exposing students' design practice to others.

3.3.2.1.1 Exposing students' design practice to others

The design process and the conduct of design action are highly personal and other students can see only the results, or what designer reveals (Arnheim 1993). But the deconstructing activity allowed students to expose the internal components of their design process for others to assess them, and provided the designer with the required feedback he may need according to the exposed components.

For example, a student deconstructed his design process by stating the main issue, the naming stage, how he formed it, how he conducted the move, and finally how he reflected on this move and assessed it. Ja explained the process in these terms:

> *"I started thinking about the roofs, they weren't working but I couldn't think of how . . . I didn't want to go boring flat roofs on them, I wanted a sort of fairgroundy roof but I didn't want a tent or something like that .".*

Therefore, Ja concentrated on his presentation on revealing the components of his design process; so, by this action he invited other students to direct their discussion and comments toward this direction (Figure 38).

Then, on hearing that, student deconstructed his design process into meaningful chunks, which enabled others to follow; in addition, other students were able to provide him with the feedback he needed.

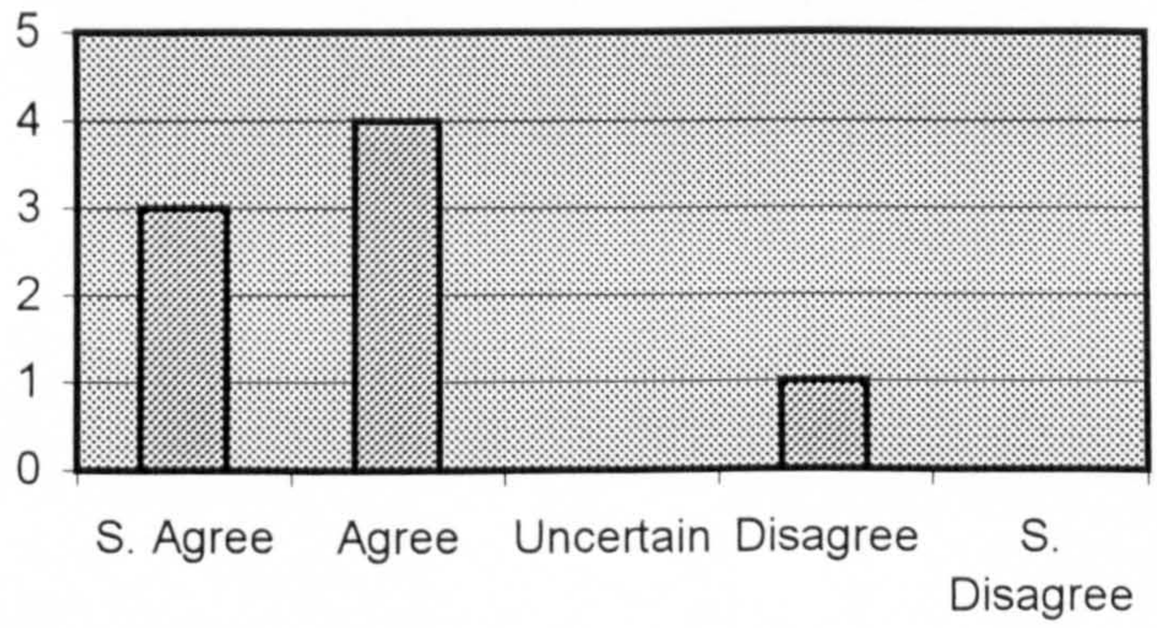

Figure 38 Exposing students to others' design experiences.

3.3.2.1.2 Increasing students' understanding

As architects utilise the solution-focused approach in tackling the design problem, their understanding is increased as they proceed toward the ultimate

solution. Therefore, the deconstruction stage provides students with the means to increase their understanding. Students utilised the deconstructing activity to increase their understanding about two aspects; first about the design problem in hand, second about the design process of other students. For the first aspect, student's feedback did not indicate any significant improvement in students understanding (Figure 39); but for the second, there are significant improvements (Figure 40).

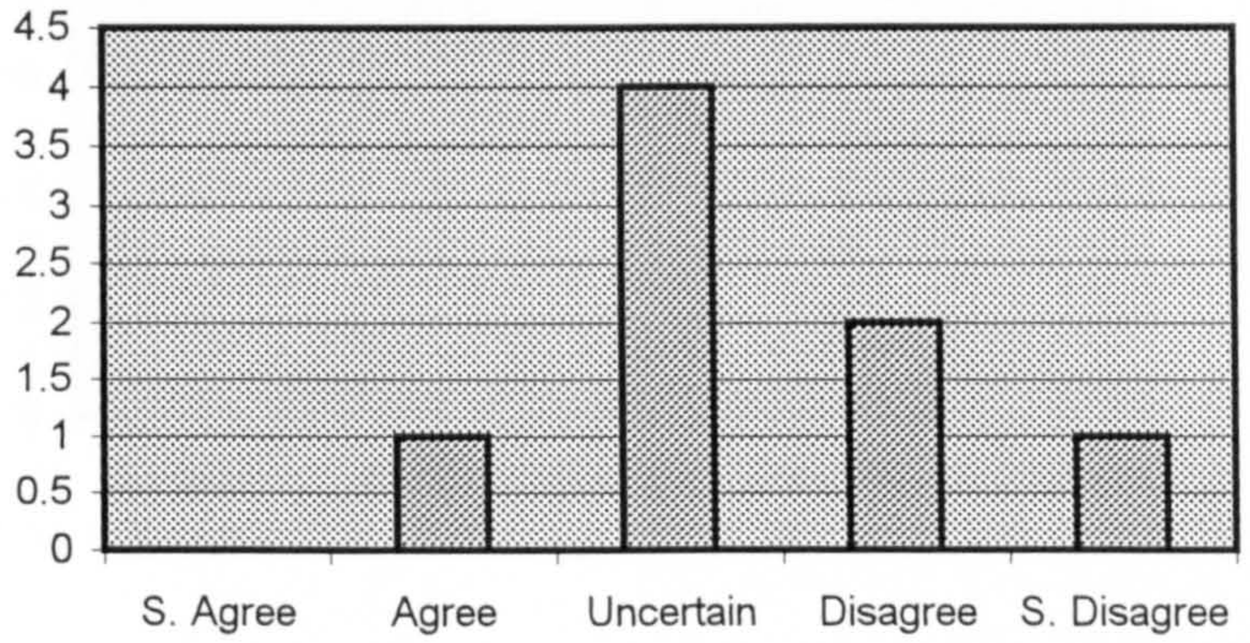

Figure 39 Increasing students' understanding of the design problem.

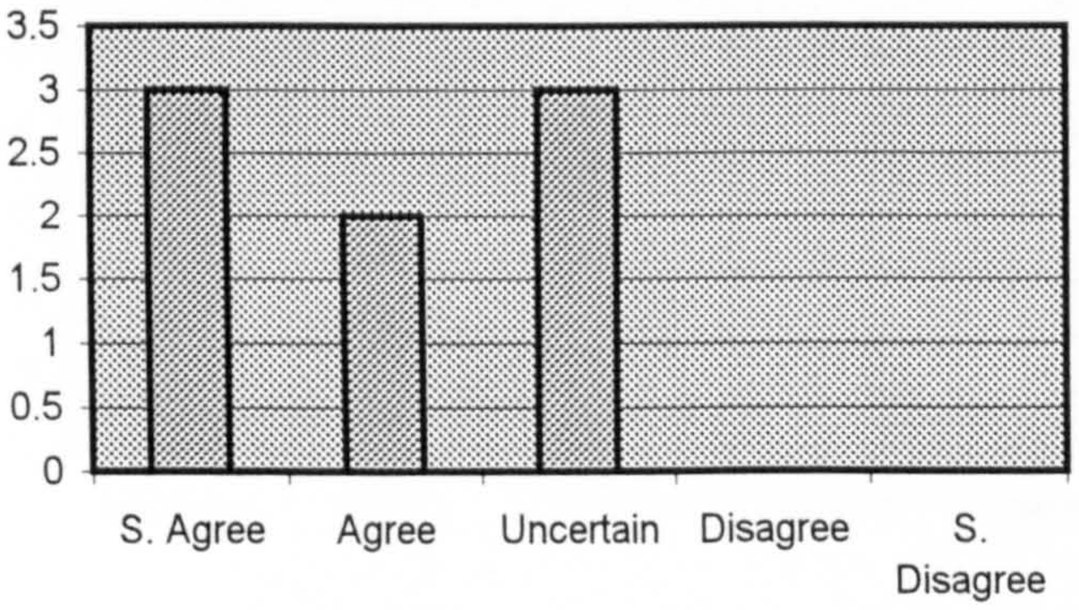

Figure 40 Increasing students' understanding of others' design process.

3.3.2.2 Replicating other students design process

Re-presenting other students' design work, and documenting their design process analysis in a form of replication report allowed students to consider other perspectives in approaching single design problem (Figure 41); and while student's design process is being replicated, this student exposed him/herself to

others, and the replicator also exposed him/herself to others' design practice (Figure 42).

In addition to that, it has been identified that students benefited in other ways such as: they experienced the reality of the design process of others, identified the importance of analysing the process, not the product, and widened their vision about the design practice.

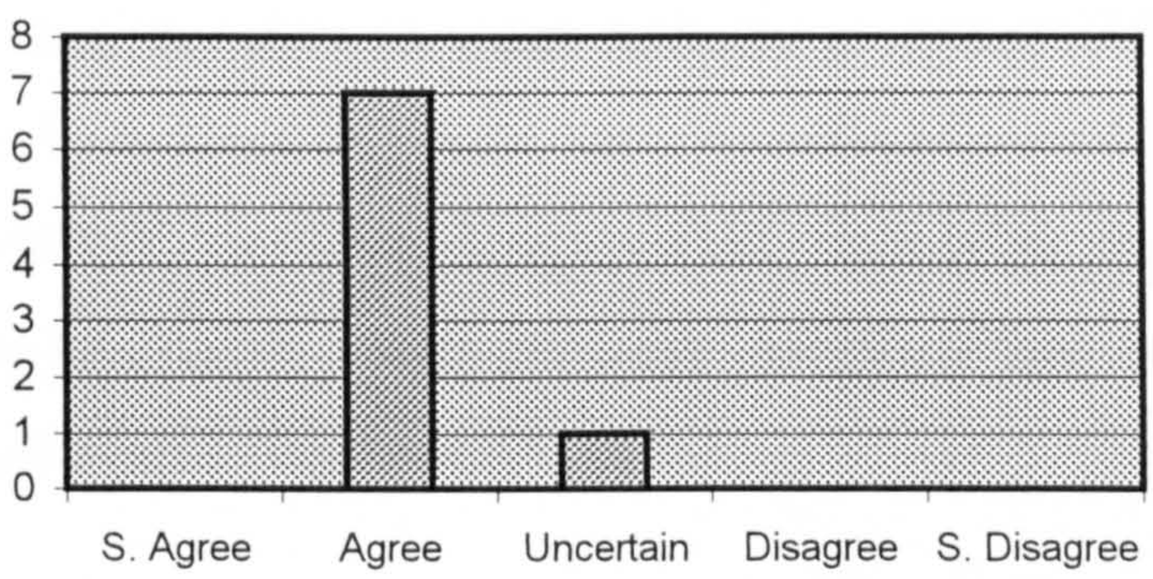

Figure 41 Considering others' perspectives on the same design problem.

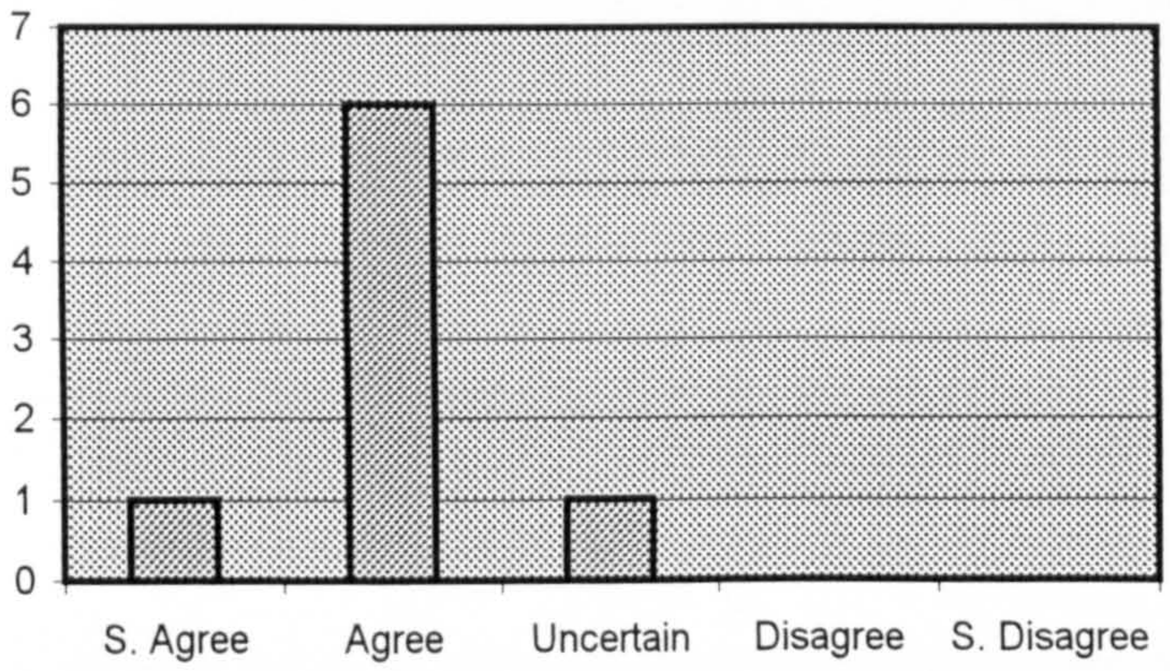

Figure 42 Exposing themselves to others' design practice.

3.3.2.3 Re-designing the project

After replicating the design action of other students, students were asked to re-design the replicated project in the manner of the first designer. This re-designing activity has multiple face advantages.

At the beginning, it allowed students to experience the design mode of others, and to see how they tackled and approached the design problem (Figure 33).

Due to the design mode of students, the stage of redesigning was simple activity

for 75% of the students, while for the rest it was difficult to take over other students' work and complete it.

The second point is that it allowed students to consider other viewpoints in solving a single design problem (Figure 43). This consideration encourages students to expand and widen their vision about design practice, and leaves space for other viewpoints and opinions in tackling and approaching design problem.

Finally allowing students to take over other students' project provided them with the opportunities to be exposed to others' and vice-versa (Figure 44). This means allowed students to view their design practice from different perspectives so they were able to identify the strong and weak features of their design practice and those of others. (Figure 45)

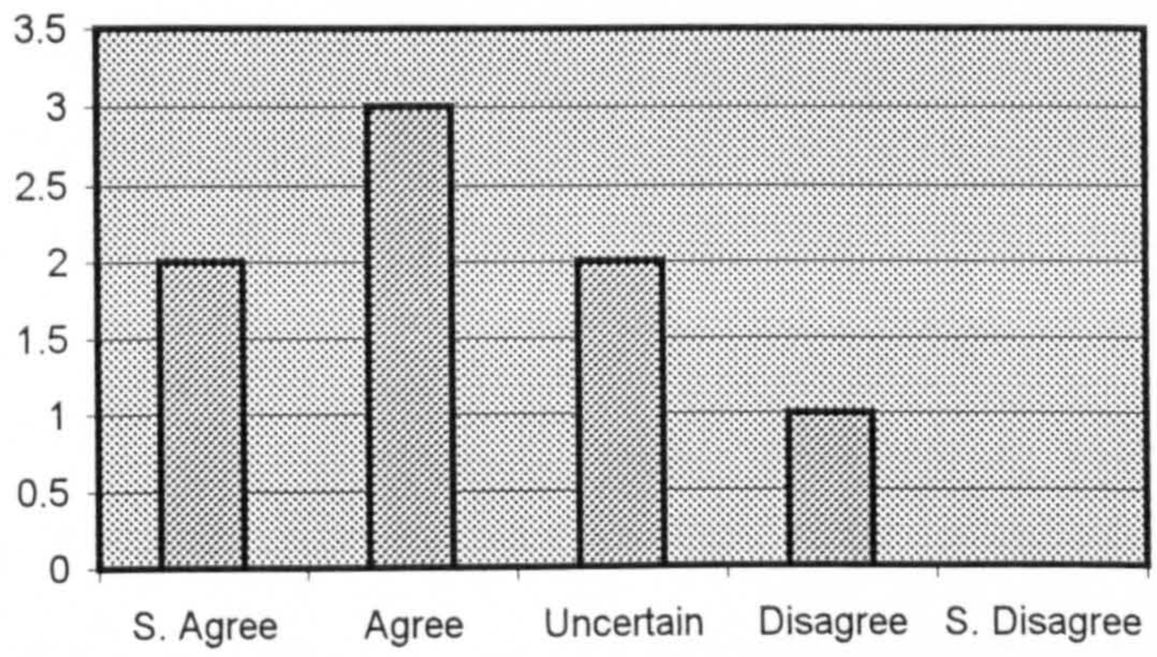

Figure 43 Considering others' viewpoints in solving the same design problem.

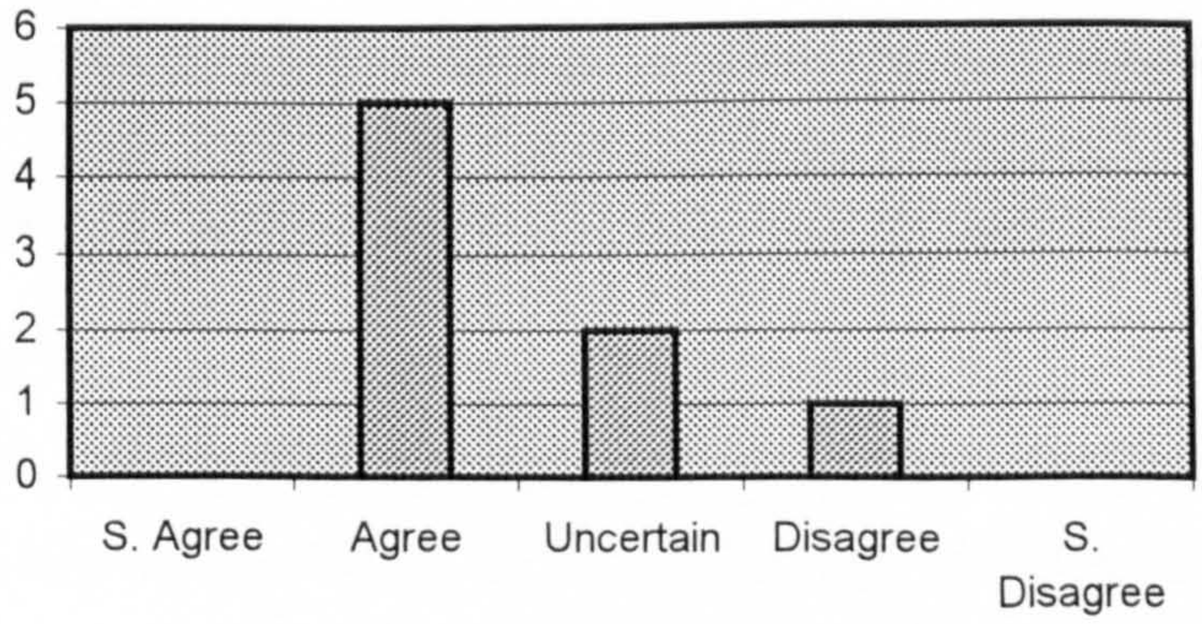

Figure 44 Exposing themselves to the design practice of others.

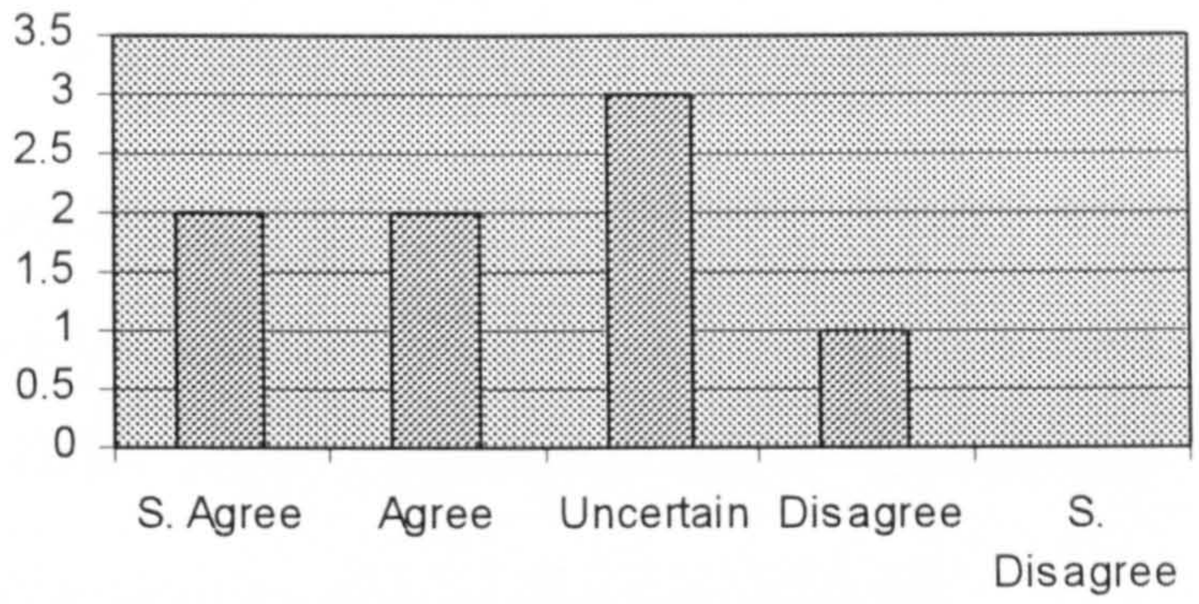

Figure 45 Identifing the strong and the weak sides of other students' design practice.

4 Discussion

This section is the last part of this chapter, which aims to present the implications of the research results. The implication of these results is limited to two domains, the architectural education in design studio, and students' professional practice. The reason behind limiting the implications to these two domains is that the ALT, as learning tool aimed to improve students design practice, was used and applied within the boundary of the design studio, and this application was aiming to prepare students for the professional practice.
Therefore, the discussions are presented according to the two domains, the first one being about what ALT provides students to improve the design studio practice and the architectural education in it, and the second one about what ALT provides students with to prepare them for the real professional practice.

4.1 Architectural Education in the design studio

This section is devoted to presenting and discussing research results' implications on the domain of the design studio, and how the architectural education within the boundary of the design studio can be improved.
The presentation of the implications will be according to three categories, first the enhancement of the learning environment in design studio, second the improvement of the design crit, and third introducing new practices. The new practices were identified from the students' final interviews after one year of the

ALT project in which students claimed they introduced new practice in their design practice to improve it as a result of the ALT exercise.

4.1.1 Enhancing learning environment in design studio

As design studio is considered a learning environment, ALT aims to improve and enhance the condition of the learning environment in the studio.

4.1.1.1 Balancing between learning and performing

In the design studio, students present their works at the end of the semester or the year in the format of portfolio, within which the glossy sheets aim to present the end products in the most attractive form. The problem of the portfolios is that they are not presenting what students actually learned, neither the skills nor the acquired knowledge. In addition to that, from the beginning of the project and during the design process, students' attention was directed toward what they could present at the end, and what to include in the portfolio, more than what they could learn or acquire. This dilemma appears in this quotation from the students' group interview, in which Ja argued that after completing the ALT exercise:

> *". . . I was trying to do stuff for my portfolio . . . . so I felt at the end I didn't have presentation sheets and stuff which you would normally feel you have to do, so it is sort of slight problem with the fact that everyone in the year was doing the presentation stuff while I felt I wasn't."*

Therefore, design tutors have to encourage students to include in their portfolios what they actually learn, and direct the studio assessment means to concentrate more on what students learned and acquired than the portfolio presentation. So, the portfolio has to balance between learning and performing, to reflect what students actually learn, and highlight the process more than the end product for the portfolio to be also a learning tool.

This aim was achieved, through the ALT application, by directing students to concentrate on the design process in their presentation and discussions and not on the end product. Therefore, they looked at the design product not as building form, but as a result of sequences, and their final presentation directed toward that.

4.1.1.2 Design tutor and student's design mode

As students vary in their design mode, and are either concept generators or developers, design tutor has to modify the studio exercise according to students' situations. Students design modes are not a preference mode, therefore they can change it if they are encouraged to do so. According to the research results, students find it difficult to change their design mode completely, but tutors must help them to direct this mode and modify it in a fruitful way. The design tutor must deal with these conditions in skilful manner, and try to direct the studio exercise to tackle the issue and allow students to take all the advantages of their design mode and overcome the disadvantages.

In the research findings, it has been noticed that the concept generators are keen at the beginning of the conceptual phases, and may or may not proceed with their idea(s) till the end. But the second type, the concept developers struggle at the conceptual stage and find it easy when they take over other students' design concepts, and develop them.

We cannot argue as which type is better for student's professional practice, but both types can play a significant role in the future. Therefore, the design tutor has to deal with them as normal conditions that need treatment.

4.1.1.3 The value of students' feedback

As the ALT activates students' participation in the design studio, this goal was achieved by considering students' work as the medium for presentation and discussions. Consequently, students' participation was active, but what students provided others with was not as valuable as the design tutor's feedback, which other students underestimated. It was noticed that there were considerable differences between design tutor's and students' feedbacks. The tutor's feedback was more theory-based and could be applied in different situations and contexts. On the other hand, students' feedbacks were less theoretical and more inspired by daily life experiences instead. Students could overcome the problem by utilising what they learned in the theory, history and structural courses during their discussions, to improve the value of their feedbacks and allow other students to utilise them in different situations and contexts.

As Mk stated when he was asked about the differences between student and studio tutor feedback:

> *" . . you kind of expect the framework to come from the tutor's, just sort of instruction as how it should happen . . . "*

Therefore, utilising students' work, as the means for communication in design studio is not enough unless students increase the value of their feedbacks by giving them a more theoretical base and enhancing them beyond the daily life experiences, so their comments can be applicable to more than one situation.

4.1.1.4 Agent for enhancing students' imagination

In our design exercise, as any other studio exercise, students visited the Fairground archives and collection at the University of Sheffield. This visit inspired students' imagination and increased their understanding of the nature of the project, what it could look like, and what it could represent. Ja stated that:

> *"It was nice to have all the archives of fairground, and see what the building was going to be, or intended to house or represent; therefore I was able to take some inspiration from what it represents and I tried to convey that in the building to some extent, I mean I think if we'd just been told . . . about the archive and had not actually been taken around, it might have sort of happened slightly differently . . . "*

The implication of that is that design tutor has to design the studio visit in an appropriate and well-organised way so students can maximise their benefit and avoid misguided influences or false inspirations, or misunderstanding of any aspect that could mislead them. Therefore, if students are asked to design a school, for example, their visit has to be done during the school day when the users are in the building, so design students could live the real experience of the users, and investigate any other aspects while they in the real environment.
In addition to that, design tutor has to utilise the different types of reflection in preparing students for the visit. The reflection for action could be utilised to warm students up for the visit. During this phase before the visit they could state the aims of the visit and what they could expect from it. During the visit, students have to document what they see or observe in suitable format to capture the visit details and utilise the second type of reflection, reflection-in-action. After completing the visit, students have to reflect on the visit to finalise what they learned from it and to discuss the lessons with others (Gibbs 1988).

4.1.1.5 Timing the exercise stages

For students to benefit the most from every stage of the design exercise, and conduct the exercise completely, the design tutor has to time these stages effectively.

For example, one student claimed that, because of the short time of the project that came after the Fairground project, she could not identify any significant improvement in her design practice even after one year of the ALT project, which contradicted other students' opinions. Ms stated:

> *" . . . the past few projects that we've done since the fairground project, they've all been pretty short projects; so because you've got such a short amount of time you can only focus on a limited amount of things . . . "*

4.1.2 Improving the design crit

Design tutor is utilising the design crit for different reasons, such as the crit for assessing, or marking, while in other cases it is for feedback or teaching (Anthony 1991 and Doidge 2000). The design crit for the ALT is considered as a learning means whereby students have to present their work not only to get feedback and asses the presented works, but also to get involved in direct dialogue with the juries and others in order to improve their design practice.
In order to convert the design crit into a learning tool, some modifications have to be made and accomplished.

1- Students can utilise their sketchbook directly in the crit. Involving the sketchbook instead of finalising drawings could decrease the students' tension about the crit, and allow them to accept any modifications that may be required by the juries, because they did not spent a lot of time preparing the crit's presentation sheets. As Ca argued:

> *" . . . opening your sketch books and talking from it to them is a lot better because if someone criticises your sketchbook it's only a sketch; if you stick something on a wall and have to make a presentation like that, if they criticise something it's like, well I've spent ages doing that sort of thing; oh I'm going to have to change it all now . . ."*

So, reducing the presentation sheets to sketches and simple drawings could make students more willing to present more sketches that reflect the actual design process more than the end product.

2- Students have to present what they learn more than the end product, and the design tutor has to encourage students to do so by directing their comments and feedback toward the process. Concentrating on the sketches and the drawing that reflect the actual design process lead students to talk about their design process, the skills, and the knowledge they acquired or obtained from the exercise; in addition, the juries could identify the aspects that focalise the comments and feedbacks. In general, the design crit could be a learning tool by assessing what students actually learned, and the juries have to direct their attentions toward what students have learned more than what they present.

3- The objective of the design crit: As Anthony (1991) claims, design crit, or jury, has different objectives based on the viewpoint of design tutor, students, and practitioners, according to which each one tries to direct the crit toward his/her needs and belief. As for the ALT which considers crit as a learning device, it accepts the view of others in widening our vision about the crit, but we have to strike a balance between them to allow students get the most from the design crit, and must not allow any viewpoint to dominate others. Therefore, ALT tried to balance between assessing students design works, encouraging students to present what they learned more than the end product, and mimicking the reality of the design professional practice. Resembling the professional practice could expand to cover different parts of the design studio practice by introducing new practice that mimic the real professional practice and not limiting activity to the design crit. These activities and new practice are the contents of the following section.

4- Design crit setting: There were two aspects we utilised in our experiment that benefited students a lot during the crit. The first one was the size of the group. When the group size is smaller, students can have more chances to

communicate with each other and listen to others' comments and feedback. The second aspect was the crit layout and the location of the students' seating area. During the ALT design crit, students' seating area was in the focal point, and the design tutors' at the back; the students were in the spot light and they were encouraged to talk and participate.

4.1.3 Introducing New Practices

According to the research findings, it was noticed that there were different skills and practices that had to be introduced in the design studio practices to improve the learning environment and increase student's active participation. In general, some of these aspects were tested in the ALT experiment, while others were not, but their importance and potential effectiveness were clear.

4.1.3.1 Create the students' precedents library

The role of the precedents, which was presented before, is also considered to be an agent of inspiration for the student's ideas generation and development. It introduced a new idea and practice in the design studio practice. The idea of student's precedent library could work as "reservoir of knowledge" (Lawson 1990) or "Frame of references" (Hertzberger 1991). The idea of the students' precedent library depended on students starting to collect as much as they can of images of architectural and non-architectural precedents, and storing them in an easily accessible medium, so students could consult it whenever they need (Lawson 1990). The practice of collecting images of buildings and other aspects related to design action already exists, but it needs modifications to maximise its effectiveness. As Lu stated at the interview, and explained the process:

> *"I think I looked at these media lines like a long time ago and I liked them, I photocopied them and kept them in a folder, and when I initially thought of the idea of the mother unit I didn't think immediately of the media lines, the mother unit idea was there first, but then I spotted like a similarity with the idea and I went back to look at this precedent which I had discovered much earlier . ."*

Therefore, creating a position for this library in the design studio practice aims to introduce this new practice in a new format and to allow students to benefit from it. The existence of the precedent library could enhance the role of the

mental images stored in the student's brain, and work as remembrance aid, so that students do not have to depend heavily on their ability to recall every precedent during the design process.

4.1.3.2 Introducing the stage of self assessment

As ALT is a learning tool that aims to develop students' design practice, and as part of its objectives is to provide students with the means to asses their own work and the design practice. It becomes clear from the research findings that introducing the stage of self-assessment is essential for students to take over the responsibility of developing their design practice. Therefore, introducing this stage could be accomplished through different actions:

1. Imposing a specific framework for students' presentation and discussion, which could allow them to expose their design practice components to others, and identify the strong and weak aspects of their practice.

2. Students have to direct their attention and concerns more toward the process than the end product, which could allow them to monitor their design practice, and to highlight its main components.

3. Creating a stage of reflection: during the design process students have to specify a stage at which to reflect upon what happened rather than keep going or 'dig on the same hole again and again'. This stage of reflection could have different applications; first it allows students to assess their naming action, during which students identify the main issues in the design problem, and determine the value of these issues. Second, it allows students to assess their frame and the way they frame the main issues and convert them into architectural formats. Finally, the reflective action allows students to assess the move(s)and how designer converts the frame into architectural building form(s). In general the stage reflection-in-action is unique in enabling students to assess their design practice while the process is in operation, and before the final end product.

4. Introducing the stage of Re-Framing: In the current studio design practice, the re-framing stage exists, but students were not able to realize its nature, and when/how to utilise it successfully. Some students claimed that at some stage of the design process they had to re-start their design process again. In reality they are not re-starting, but actually re-framing the design problem or their situation, and either ignoring or discouraging the existing frame. One student called this action as "correction of some problem", which it is, in reality, or in the research terminology, a stage of re-framing. On another occasion, students got stuck during their design process and could not take their process farther; so, they had to return a few steps back in their design process and repeat one or more stages. This act is also a re-framing action during which students return back to the preceding move and reframe the naming stage, conduct new move(s), and resume the design process again. Most of the students encounter the re-framing stage but cannot identify it, neither by name nor nature. ALT highlights this situation but in a new format so that students can understand its nature, know what they have to do, and how to react if they are faced with the situation.

5. Managing the design process. According to the students' feedback in the final interview conducted one year after the ALT exercise, the ALT, as a whole or in part, impacted on their design thinking system. As a result they utilised the ALT as design technique without naming or identifying it as ALT. The unconscious utilisation converts ALT as a brainstorming technique, which students could use whenever they need. As Ge stated at that interview,

> *". . so it kind of feels like the things we learned kind of become almost . . automatic; I don't mean that, you know, we've just learned things and we just do them automatically, but it's almost like that, but you just kind of learn things and you then just do them, they become more natural processes, and so you're not thinking "oh, I'll have to identify this and I'll have to do that" . . . it just starts to become a more natural way of thinking about things . . ."*

Consequently, as students adopted the ALT as design technique, it became the students' responsibility to apply it and modify it according to their needs and ability. Also, in the final interview many students stated that ALT

helped them to manage their design process differently, and they introduced new skills and practice to control the design process and make each design exercise as learning activity. De put it in this way:

> *" . . I think what I did actually for this year [after one year from the ALT exercise] was actually do a big sketch, setting down the concept of the project and presenting ideas in two big sheets so I can actually follow-up, do some follow up work on that sheet . . . [these sheets are] representation for myself so I can actually go back to that big sketch and see what happened . . . "*

Mk also stated:

> *" . . How I structure . . design stages, [he does] some quite basic things like dating my work, but also sort of looking at it when I've made breakthroughs, and when I've made successful moves and things, so it's a lot easier to identify and sort of talk about it . . because I can say that's a distinct move . . "*

Ge added:

> *" . . . I think it helped, having motions of isolating problems and restricting what you are trying to do . . what you see as the main concerns from a brief of a project or a problem . . "*

Also, Ja presented the implication of ALT in a different format, and explained:

> *" . . I don't suppose I would have taken on the language that we sort of talked about during the project, but more so the processes when you sort of come to a bit of a problem, stepping back from it and trying to identify what that is so you can concentrate on that one issue and sort of try and solve it and all sort of related things like framing and other things I wouldn't have thought of covering in the terms we actually used . . . "*

In general, we cannot claim that all of these implications occurred because of the ALT exercise, but the main contribution of the ALT is in directing the students' attention toward their design practice, and enabled them to take over the responsibility of improving it. In addition, it directs students' attention

toward the process more than the end product which is another contribution. Finally, it also encourages students to consider every design exercise as a learning opportunity they have to take advantage of.

4.2 Students Professional Practice

Preparing students for the real professional practice is the aim for many design tutors, and other faculty members in the schools of architecture. Each one tries to accomplish this aim from different perspectives.

For this researcher, the means for accomplishing this goal was by mimicking the real professional practice by involving students in activities that reflect the real professional practice. There are different skills and techniques the researcher introduced, during the ALT project, and which he directed students to practise in order to experience the reality of the professional practice.

4.2.1 Means for group communication

As the group work is the essence of the current professional practice, either with architects or with non-architects, students have to acquire the means for successful communication. The main aspect in any group work is the meaningful communication between the group members. If each member can talk to others and discuss with them about the work in hand in clear manner, the group work can progress, and every member may complete his/her task successfully. During the students' discussions and replication activities, ALT provides students with the means of communication by imposing a specific framework on the discussions and the presentations activities. This framework brings all students to share their thoughts and talk to each other directly.

Mk claims that the advantage of the ALT project is that:

> *" . . it was interesting there was a lot more interaction with the tutors and with the other people [about] project work, which you don't always see . . "*

Therefore, the provided communication means helps students during the design practice for successful interaction, and may provide them with a tool they may use for their professional practice.

4.2.2 Taking over another student's design work and developing it or completing it

In addition to the importance of the communication means in the group work, there is another aspect students have to be ready for, and the skill for it has to be acquired. According to the nature of the group work and the professional practice, more than one designer have designed most of the projects; the first designer generates the idea(s), and other designer(s) take over the project and develop it farther. Therefore, students have to understand this reality of the professional practice, and prepare themselves for it. The stage of re-designing has the same objective, with one student doing the conceptual stage of the project, while the other student takes over the project at this stage and completes it to satisfy the new condition and requirements. This act has two advantages: first, it allows students to identify their design mode, either as generator or developer, which has implications on students' future design practice, and what students could do during the school years to improve the condition of their practice from this perspective. Second, it allows students to experience the reality of the professional practice, and prepare themselves for it. Indeed during the ALT project some students found this stage difficult, while others not. Therefore, each student could know exactly his/her ability for the future practice.

4.2.3 Practitioner's professional skills

Each practitioner differs from another one by what he/she acquires from the professional skills. The number of these skills may be unlimited, but it is what actually distinguishes one practitioner from another.

According to the research findings, two skills have been identified which students could pay attention to, and try to acquire.

The first skill is freezing the good ideas for future need. Some students, during the experiment, were forcing themselves toward one single idea, and trying to implement it in the project. They squeezed the project brief and site in order to adopt this brilliant concept. At the end they were unable to do it, and to complete the work successfully. The idea of freezing concepts could help students to overcome this problem, and not to feel sorry for losing an idea. In

addition, it helps create another opportunity for utilising these ideas in other projects.

The second skill is the design mode of parallel lines of thought. This mode occurs when designer tries to deal with two ideas or more at the same time. Instead of losing one or more, the designer tries to freeze one for a moment and deals with the other, and after working on that, returns to the frozen one, and so on. The good designer knows how to deal with many lines of thought at the same time. The idea behind raising this issue is that: it had been noticed that more than one student stated that they experienced such thing, and did not know the nature of such mode, nor how to deal with it. So, the idea of parallel lines of thought was introduced to the students with the introduction of the ALT to help them understand it and deal with it successfully.

Chapter Six

Conclusion

1 Introduction

This research has been investigating one important aspect in architectural education, that is the development of students' design practice. It investigated this aspect from untested perspectives that allowed the researcher to highlight different issues that develop the condition of students' design practice. This research reached the conclusion that there are great possibilities in developing students' design practice in which the research approached the dilemma from students' standpoint. The lead was given to students to take the responsibility of developing their design practice.

This chapter, which is the last chapter of the thesis, aims to re-present the research results and findings not as they were presented in the preceding chapter, but in the manner of reflection on the research prime sub-questions.

2 Reflection on research prime question

As the previous chapter presented the research results according to the research prime question "How students could develop their design practice, and learn from their prior design experiences", this section is devoted to reflecting on these results according to these sub-questions:

1- Can design practice be developed? And, how?
2- Do students have a role in developing their skills?
3- Does the design studio practice and set-up have a role in the process of developing students design practice? And, if so, what should the studio setting be?
4- Does learning from experience have any implication on developing design practice?
5- What is the potential role of the design experiences in developing student's design practice?

According to the research results, the first two questions have been fully investigated, leading to the proposition that if we activate student's participation in the design studio practice, design practice could be developed and students could have a distinctive role. In addition, they could share the responsibility

with design tutor in developing the design practice. The design practice as practical skills could be developed through two actions: doing and thinking about the process. The first one is well known as "Learning by doing", while the second one was approved and supported by this research. Raising students' awareness about the design process allowed them to consider every design action as learning experience, in which they took the advantage of the action and exposed themselves to the experience.

The means for developing the design practice has been investigated in the light of the research hypothesis which proposed that the means for developing design practice could be achieved through the involvement of students' prior design experiences in the design practice. This involvement created the environment for students' active participation, and built students confidence in themselves in developing their design skill. Involving students prior design experiences, as research approach, has been proved to be successful in developing students' design practice, which opened the gate for other researchers to invent and develop other research approaches.

The implications of this research approach affected different aspects in the design studio practice in which the design crit, as an important element in the design studio practice, was converted into a learning tool. This new consideration allowed students to utilise the crit for understanding the design practice and the nature of the design process. The improvement of the design crit is considered as the answer of the third question, which also raised the issue of design studio set-up and its role in developing design practice. The studio set-up was not investigated deeply, but this researcher, building upon other research results (Doidge 2000), arranged the design crit in a way to encourage students to be active.

The design studio environment is a large domain, and researcher tried to investigate these two aspects, design crit and studio set-up, which the results confirmed to they have significant role in developing students' design practice; but there are other aspects that need more investigation, such as disk crit, and how design tutor could design the design studio exercise.

The last two questions are related to the second one. Here the means for developing students' design practice was by involving of students' prior experiences. As involvement created the environment to investigate the role of

this type of experience in the development process, researcher utilised a completed student's project as means for such involvement; and as result, the potential role of such prior experiences was investigated, and proved to be affected.

3 Further works

It is of the nature of any research work- and this work is no exception from that point of view- that it always requires further investigations and endeavors to complete and improve its results and findings. Future and further research might consider these essential aspects:

1- As students consider ALT, one year after utilising the tool as design technique for developing design practice and assessing the design process, the technique has to be formulated in appropriate format. In formulating the ALT as design technique, we could provide studio tutor and students with as a simple design technique that could be utilized whenever students and tutor need it. The final format of the ALT could be in determining the stages that clearly describe what students and tutor have to do, and the sequences of utilizing the technique.

2- In monitoring students' design practice improvement, we have to involve design tutor(s) in this process, in which, design tutor could help to asses the reality of students improvement, and what other aspects are that may cause this improvement. How students really practice design in studio out side the crit has to be investigated also, and feedback has to be acquired from different sources.

3. In the case of repeating the experiment in another country like Saudi Arabia, the homeland of the researcher, different cultural variations have to be considered. These cultural differences require more investigations to clarify their roles and implications on student behaviour and attitude. These issues are raised hear because it was noticed that part of students' attitudes during this research experiment was due to the students' culture and rather than the educational setting.

4. During the data stage, there were some contradictions between the questionnaire's and the observed sessions' data. These contradictions arose from

the misunderstanding of some research terminology in the questionnaire. The solution to this difficulty could be achieved by distributing the questionnaire after completing the data analysis of the observed sessions.

5. In proposing new format of the design crit and the design studio practice, different aspects have to be considered, such as the ratio of design tutor to students and its financial implication. It would be ideal to have a small number of students in each design project but school resources have to be considered.

6. The main dilemma of the current format of the ALT is its one time-usage only, as was mentioned at the first group interview, since ALT's successful operation depends on its hidden sequence. The nature of the problem is this: once students have utilise the ALT, they can no longer benefit from its use again. To overcome this dilemma, ALT has to have different versions, in which students could apply the tool again and again for the same objectives; in the first year for the sake of improving their design practice, and in the second year for the same reason but with advanced version to match the students' level and educational objectives. As a result of that, the ALT format could become part of the architectural educational system and could follow students' from the first year level onwards.

7. For future research and during the interview, the amount ratio of interviewer's and students' talk has to be reviewed in away that allows students to contribute more than the interviewer, which was not the case in this research. Therefore, interviewer should be facilitator only.

8. In presenting the experiment data, clear distinction has to be made between the data obtained from the first interview conducted after the completion of the research experiment, and that obtained from the last interview, conducted one year after that. This could allow other researchers to identify the implications of ALT on students' behaviour and attitude, and the improvement of their design practice.

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Appendices

Appendices

Appendix A: Questionnaire

Appendix B: Interviews

1. ***First Group Interview***
2. ***Final Group Interview***

Appendix C: Experiment Project

Appendix D: Publications

Appendix A: Questionnaire

A questionnaire for the Architectural Learning Tool

The Purpose of this questionnaire is to assess the performance of the new learning tool LT), which aims to provide students with a new model for presenting and discussing their design practice and that of others.

Themes	Strongly Agree	Agree	Uncertain	Disagree	Strongly isagree
A- Deconstructing the Design Process					
Deconstructing the design process into four activities:					
1- Provides students with new means for presenting their works.					
2- Provides students with new means for discussing their works with others.					
3- Provides students with new means for re-presenting others' works.					
4- Provides students with new means for discussing others works.					
5- Provides students with means to assess their design practice.					
6- Exposes students to others design experiences.					
7- Allows students to acquire the analytical skill for analysing others woks.					
8- Increases students' understanding for the design problem.					
9- Increases students' understanding for others design process.					
10- Creates the base to encourage other student's feedback.					
11- Allows Students to explicit their design process.					
12- Draws a complete picture of others' design process.					
B- Replicating the Design Process					
By replicating others design process, according to the four activities, Students:					
1- Identify the reason behind many design decisions.					
2- Assess others design practice.					
3- Identify the missing opportunities.					
4- Identify the ignored design approach(s).					
5- Identify the strong and the weak side of other student's design practice.					
6- Draw other' designer's line of thoughts.					
7- Consider other's perspectives for the same design problem.					
8- Expose themselves to others design practice.					
9- Acquire the abilities to re-present others' works.					
10- Look at their own design practice from different perspectives.					

C-Re-Designing the Project						
	By Re-designing the project, in the manner of the first designer, students:					
1-	Experience the design mode of the other designer.					
2-	Consider other's viewpoints in solving the same design problem.					
3-	Expose themselves to the design practice of the others.					
D- Learning from Experiences (Role of Precedents)						
	The Precedents:					
1-	Expand student's frame of references (1).					
2-	Generate design idea(s).					
3-	Enrich the design process by providing student with a ready-made design move.					
4-	Enrich the design process by providing student with a ready-made design frame.					
E- Studio Setting						
1-	The new design practice encourages students to be more active.					
2-	Student utilizes the new tool to reflect upon their prior design experience.					
3-	Every design action could be deconstructed into four activities.					
4-	Significant differences have been identified between the new design mode the existing one.					
Additional Comments that are not included above (use other side if needed)						

(1) *"Every thing that is absorbed and registered in your mind adds to the collection of ideas stored in the memory: a sort of library that you can consult whenever a problem arises. So, essentially the more you have seen, experienced and absorbed, the more points of reference you will have to help you decide which direction to take: your frame of reference expands.* (Hertzberger 1991)

Appendix B: Interviews

1. First Group Interview

2. Final Group Interview

I. First Group Interview

Prof. Bryan Lawson conducted the first group interview after the completion of the project.

Interviewer: How did you find the exercise?

Lu: I quite enjoy it actually

Interviewer: Was it the right thing to

Lu: Yes I think it was the right thing

Interviewer: Its kind of odd because of the occasion wasn't it

Ge: Yes I think it would have been nicer to have it all in one go yes

Ja: And the result at the end as well cause it was a bit unresolved at the end because we didn't sort of finish we sort of left it hanging I felt well mine did anyway.

Ms: Seemed a bit in balanced, we seemed to spend more time on the first half then we had the holiday and came back and the second half was a little bit

All: Yes

Interviewer: Actually I mean we were a bit funnily enough I'm just doing something else at the moment I think its with we are currently looking at the whole structure of the academic year which isn't something that will effect you at all because if we do change it it will take us a year to do it but it's a real pain because we have this kind of semester system we also have Christmas and Easter holidays and Easter moves around because of the way its calculated on Christians so we are kind of left in this mess and ideally I think we would like to work out ?? there again, is there a project that it would be worth us running again do you think I mean is it something that its quite inspiring for us this is it worth us running again

All: Yes

All: Yes

Ge: I think you would have to make sure they don't know what is going to happen though, like bind our mouths so we can't

Interviewer: You would know what was going to happen well that's what we thought which is why we were a bit sneaky at the beginning you now realise why yes, if you actually knew from the beginning the subject wouldn't work well

Ms: No not at all

Interviewer: Did you get a surprise when that happened did you think what the hell are they up to here what's all this about,

Ja: I think it was

Mk: We had a suspicion that something was going to happen it wasn't quite right

Interviewer: Straight forward was it, and obviously there is two things going on here, well several things going on there usually are in projects, obviously one thing we tried to do is move you forward in terms of your architecture sensibility the other thing is to try to develop technique which gives us a much more direct way of dealing with processors and processing product and the third is that we've got ? doing some research with us on the structure you highlighted because so often we do these things and we don't really know actually how well they work out, actually work that Ahmed and I are doing is based on a whole set of theories about learning and the design processes, so I guess it would be quite interesting just to reflect back now on what a) what you think you learned and didn't lean how we might make the project better apart from the problem with the timing lest imagine ? it sounds like you feel its about the right length anyway, except when you say it wasn't resolved at the end was that your fault or our fault

Ja: Partly because it was a bit detached from the other studio stuff that we did so sort of in the back of my mind I was trying to do stuff from my portfolio for me put it and it wasn't that wasn't really the aim of the project so I was a bit I felt at the end I didn't have presentation sheets and stuff which you would normally feel you had to do, so it sort of slight problem with the fact that everyone in the year was doing the presentation stuff and I felt I wasn't

Interviewer: Left out is that

Mk: Yes, adopt the work that we did and then sort of re do it and change it slightly to put in the portfolio for the other day

Interviewer: Yes

Ja: That's just being conscious about marks and things which we shouldn't be but

Interviewer: No I think that's perfectly understandable, and its one reason why again the other question is where we do it in the course we thought that first year would be too soon and we thought third year you would be panicking because you would be more than conscious of the marks, so we thought the second year was the right place to do it is that do you think that's right,

All: Yes

Interviewer: You wouldn't make much sense of it in the first year

All: No

Interviewer: And next year you are going to be far too worried about your portfolio I think so you wouldn't be very patient with us you'd, I think this if for the I think I might have said this to you right at the beginning but it is one of the paradoxes of the CU project for architecture in general I think its highlighted by this very particular project, which is that there are only two things going on one is that you're performing and being examined because we use continual assessment all the time, and the other is that hopefully much more importantly you are learning and actually the two things are not always necessarily very compatible, the pressure to perform on every project and produce the glossy sheets for your portfolio and all the rest of it isn't necessary conducive to reflecting on and leaning and in the end the strange thing about it is that while you doing it you should be worrying an awful lot about producing these wonderful ? results but you think about it in a couple of years time that's no constants at all its what you learned that really matters, so can we just talk about that for a bit what, what in what way do you think the project has do you think the project is going to have any effect of what you might do in the future as has it left anything with you do you think about the way you're resolving the way you think about the redesign anyone

Lu: Like the techniques will help us to look at other people's design processes but I thought maybe that would not have been possible to do if you won't have the chance to talk to the people directly like I probably couldn't look at another architects work and analyse it in that way if I couldn't talk to them directly conversation with them

Interviewer: Why do you think that is

Lu: Emm

Interviewer: I've got an idea about why the ego

Lu: Well I could probably guess how other architects kind of the what the design process might have been but how we did it we could be certain of what things because we could ask and talk

Interviewer: You agree with that everybody agree with that

All: Mme

All: Mme

Interviewer: But I think you raise a very interesting point you see because actually I'll bore you for a bit obviously I did quite a lot of research of this kind and so does Ahmed about design processes and really its very difficult to do because there are several different things you can to to investigate a mental process, and one of the problems with it is is that if you just look at what goes on you don't see the interesting things because you were handed drawings and things but you still can't work it all out there are still things that aren't in the

drawings I think you're saying, the problem is that is you actually ask somebody to talk about what about it while they are doing it you are interfering with it getting in the way, imagine how irritating it would be if you were trying to design and all the time you were saying what are you doing now what, hopeless wouldn't it so in a way this is kind of compromise but what we hope is that in having some kind of thought of how somebody else has designed its actually given you some, it will be very interesting we actually would quite like to talk to you again maybe next year, but whether that leaves you with anymore thoughts that might help you the next time you're designing and the next time you're getting stuck to think about some of these ideas about making rooms and reframing the problem and just maybe the next time you run into a problem it might make you tell me if I'm right or wrong, it might make you more willing to just spend a few more minutes reflecting on what you're doing instead of carrying on trying to do it seems to me that tell me I'm right or wrong here it seems to be that one of the problems when you're learning design is that you often just keep as (name of famous person) said would say you just keep digging the same hole deeper and deeper and keep trying to force an answer instead of actually stopping and saying what else could I do here, not about the product but about the process do you think there's something in that or

Ms: Yes quite hard though cause its kind of like an instinctive thing because I know its hard to like change the way you think because its not something you consciously do so yes

Interviewer: I think that's a very good point and in fact one of the it seems that one of the whole gauges is of what you're all about and which is actually one of the most important things you're doing while you're here is the learning the design process but most of the time you're teaching yourself, the rest of the time we're teaching you about what to do with the product aren't we teach you about history of buildings, technology of buildings, theories about design, but we don't spend much time about teaching you about processes and one of the reasons for that I think is that is that if I taught you how I did it that wouldn't necessarily help you because you wouldn't necessarily naturally want to do it that way so in the end you have to teach yourself, but the danger is that you just fall into bad habits

Ms: Yes

Interviewer: If you don't actually self consciously every now and then say em try and reflect on my process a little bit, how much be honest how much have you done before you have done this project how many how many of you would say you ever really stop and think about what you are doing as opposed to the design itself, during the design process do you ever stop consciously and say am I going in the right direction should I be doing something else how often do you do that would you say

De: For my closing project I tended to go backwards, and then think of looking again like getting ? in one direction

Interviewer: Right

De: So I think I was actually kind of looking back to my work my previous work and then trading this off better situation

Interviewer: Well you often hear you often hear design students talking to each other about their project work for example I might quite commonly I might get in the lift one day with a couple of you and I hear one of you saying to the other how are you getting on with your project and the other one say oh I've just started again some phrase like that cause you can never actually start again but what you mean is I've thrown away the frame I've been using and I've gone back to looking for a completely new frame and it seems to be is that one of the key skills is actually to learn when to do that in design that actually on the one hand you will actually battle away at making things work, on the other hand you've got to be completely prepared to say it was a nice idea that but it isn't going to work this time and actually throw it away and reframe it, rally it seems to me the really good designers just do this at the right time automatically, instinctively but for the rest of us we've got to kind of say every now and again hang on a minute what are the alternatives here shall I carry on trying to make this work or shall I actually go back and reframe it in a very deliberate kind of way, and I've got a feeling that quite often at you're stage of development of design em there is a tendency to keep on working on something that you maybe quite like in someway or another but actually it turns out to be the main problem, if I had if I could summarise when I sit down with a student at the drawing board more often than not the problem they are dealing with is a problem they've created themselves rather than to do with the way they are framing the problem and they've got this lovely idea and because its quite an attractive idea they don't want to let it go they are quite pleased with it, but actually its just not going to work this time round for some reason or another maybe on this site the brief isn't quite big enough the building isn't quite big enough or what ever it might be so is that something that you recognise that at all

All: Yes

Interviewer: Actually I would like to say when we examined as we are just doing right now when we examined the sixth year students right at the end of the course really examined them by what they had put in the bin and what they'd put on the wall the really good designers are the ones who had been able to say oh that was a good idea but not now, and remember it because it could become a frame or a president for future use nothing is ever lost actually cause you can never actually foresee these things so they can be ideas that you can actually come back to on other projects or even later in this project once you've reformulated in some kind of way

Interviewer: Ok well one of the things that I would just like to, maybe its not always easy to talk about in a group and I know I think I'm just talk to you individually but most real world designing in architecture is not much like what you are doing here, you probably seen that already the vast majority of pieces of architectural work are much more team activities than your than what you see in the studio, you're working with obviously engineers, with real clients with

planning authorities, alsorts of things but you're also off working in an office with several architects so its much more of a team activity and what what you need in a good architectural practice is a variety of skills not necessarily all the same kind of skills, and one of the things that we are quite interested in is the extent to which different people here might feel they've got different kinds of skills of the design process if you might take if you agree that you have you might take two views of that one is go for your strengths become that sort of designer and the other is maybe spot if you've got some weaknesses and see if you can get better at them, but one of the things it seems to me to be thrown up by this project is some people seem to find it easier than others to take somebody else's idea and work on it, did you find that really difficult to do, did you find it really hard to do

Ja: Yes

Interviewer: Yes you did, you found it fun to take somebody else's work and work on it

Ms: It is quite a good idea to start off with in the first place I think

Interviewer: Ok, but you quite enjoyed that idea of making it work yes

Ms: Yes

Interviewer: Yes is that right this isn't something in a way that we should be too surprised about because actually that's, we think a relatively common division and one shouldn't be you know Mis Van said God is in detail its not necessarily the idea in the beginning that's the big the important thing it's actually making it work that might be the important thing, but possibly when you're just designing by yourself you don't notice this, now you've suddenly been faced with taking somebody else's idea on and actually again that is something that you may well have to do in real practice because you may be the likelihood is the first time you go and work in an architects office, you're not actually going to be, I'm sorry to give you this bad news but you're probably not going to be invited to design an opera house probably going to be given some job that some other architects already done some early sketches on maybe you've got to work it up and so the skill that we are looking at there is quite an important skill which is trying to get under the skin of an idea understand it and kind of go with it so actually quite important kind of skill maybe its not something we very often see in a school project which is another reason for doing this project. So some people found it easier than others but a little bird tells me that at least one person just couldn't get the hang of the other persons idea at all is that right somebody couldn't do it at all, no somebody wants to

Ms: It was you

Ge: You

Interviewer: You found other ideas coming backward into your head,

Ge: It wasn't it wasn't the idea that I had for the first theme it the other one Yes just new ideas and

Interviewer: Are you someone who to new ideas what we might call concepts or parties come easily or

Ge: Don't know, well yes I guess that's one of the bit that I like doing the most

Interviewer: Getting the initial concept

Ge: Yes I know I quite enjoyed this project because its I just had the opportunity to do two concepts and I didn't have to work them off

Interviewer: Right,

Ge: But I am quite aware that is perhaps a flaw in my

Interviewer: No I'm not being

Ge: No no

Interviewer: I'm not being judgmental about it I'm just actually trying to what's important is actually that you start to think about as for yourself decide because as I say there are two ways of responding to that one is to say well that fine with me I'm going to be a conceptual designer and another might be to say well I'm one of the real resolvers the detailers the workers up and there in most good practices you have to have a combination of these sense of skills just you simply couldn't do it otherwise I just people can work without the others but that's not just a matter of design that is quite common in all sorts of ? activities actually, it might be true in management or politics even but somebody has the original idea for some reason but they can't seem to quite turn it into a resolved practical proposition, that is one of the things that is quite commonly said about the British is that they are quite good at having ideas but they are very poor at working them up whereas for example culturally I'm not sure where you come from but culturally the far eastern cultures turn out to be much better at working ideas out so if you look at the history of the twentieth century its been very much a case of often of a lot of the inventions coming from this part of the world actually turn into commercial propositions in Japan, that is not uncommon and maybe that's something to do with the education system, where do you come from

De: Hong Kong

Interviewer: You're from Hong Kong

Vi: Yes the same

Interviewer: You're from Hong Kong

Interviewer: Because the likelihood is this is tricky territory to get onto, the likelihood is that your educational background and your culture gives you a much greater respect for convention than people that have been educated in England but you're more you're more willing to conform in a way

De: I do think British people do think a lot better in

Interviewer: Do you

Interviewer: Its just different

De: I've lived here five years but normally they don't work out but for for we people we think more technical uses which I ??

Vi: the people in the West in general they have come more creative ideas than those in the East I think,

Interviewer: I think I would actually change your uses of word creative but I understand exactly what you mean, I know what you mean I don't dispute what you are saying its just to me creative is not just necessarily just different I think some of the weaknesses actually of the West particularly in the second half of the twentieth century we thought that originality was all that mattered and I don't think it is em in fact who was it that said its better to be good than be original forgotten who it is now was that is it Hertz Berger em and I kind of think I kind of agree with that, that actually there's been a cult certainly when I was a student of architecture there was certainly a cult there if you had a different idea to everybody else that was good, well its not its only good if it works, just being different isn't actually good persay I think we've kind of over valued that whereas maybe your society maybe over values the kind of resolutions things in a way

Vi: I just think it allows for more kind of inventive more you know adventurous approach here whereas back in Hong Kong it tend to stick to more conventional more prevent issues enough

Interviewer: You notice that

Vi: Yes

Interviewer: Is everybody else educated in England in school and

Lu: Germany

Interviewer: Germany, how do you see the British do you see a difference

Lu: There is some difference yes, obviously yes there is some difference but mme what actually it is I think in general people are probably a lot more relaxed that is the initial thing I kind of notice in terms of working in general for everything

Interviewer: Also means relatively in discipline as well then

Lu: Em that's not necessary what I thought of I'm rather kind of maybe also more stressing about things more kind of Laid back

Ge: I think that's just your friends

Ms: Makes them

Lu: No the obvious example hasn't the best example I can think of for example is like the queue at the bus stop and in Germany everybody tried to push onto a bus but I mean it takes often much longer than just like relaxing and just queuing up

Interviewer: OK if you were asked that we would very like any advice that you could give on how the project might be altered the next time round is there anything you think we could do better, did we get the was the kind of project that we set the right kind of project for

Ja: Seems to be something that we can do quite simply, its like we all sort of designed single storey buildings and it was all quite basic

Interviewer: Do you think we got that right

Ja: Yes beccause

Interviewer: We argued for ages about the kind of project that was set for this for all those reasons

Ja: Been any more complicated it would have stuck on the detail too early

Mk: Yes if it was too complex you wouldn't have advanced it far enough for it to be passed on carried on

Interviewer: At one point we were going to set a make the project demountable so that it had to be able to be put on the same building had to be put onto ? I got worried about because I thought you would spend too much time worrying about the technology and the demountable structures do you think that's right

All: Yes

All: Yes

Interviewer: It was a nice idea but I think we were right not to do, it had to be a project that was quite imaginative spacely and quite interesting but not too demanding in terms of complex circulation of and it didn't take a huge long time to understand the brief but the brief had to be slightly wacky inspirational which was did that work was that ok

Mme

Ja: Found it a bit difficult at times because we were proposing a sort of membrane structures and things and you can't just do a little sketch and say that's what it is

Interviewer: Sure

Ja: Lot more development which I thought made it a bit hard because it was like you wanted to do it but

Interviewer: Ok

Ja: It was

Interviewer: That's part of the problem with you growing up technically I think actually the kind of thing you're talking about you really can't do unless you've got a pretty good technical mastery of it the likelihood is that you'll never get that actually you'll always have to rely on some people working with you technically, unless you repeatedly do instructions of that kind, if you have you seen the Don Valley stadium

All: Yes

Interviewer: Which is kind of the structure you're talking about and obviously that's done by architects that Terry Hunt whose an engineer who works here that is probably have you met him yet, probably see him next year he works with some of the duel students who are doing the duel engineering course but he's an expert in that kind of structure, you need somebody like that working with you, but actually that leads back to this project theme again because what we find is that the there aren't many engineers who can do that well because actually what they need to do is do what we were asking you to do in this project which is to understand what you're trying to do even though you can't yet clearly ? and work with you in the technology instead of imposing the technology on you, and one of the reasons why Tony Hunt is such a highly acknowledged engineer is he's what we call an architects engineer he actually understands the architectural concept and try and work with you, there's a lovely book published by him two books published by him go to the library they're called Terry Hunts sketch book, have you seen it yet,

All: Yes

Interviewer: You see the kind of thing I mean, so engineers like that are terrific but the other point to learn is of course is that as an architect you've got to somehow explain to people like engineers who can facilitate your ideas what your ideas are, what you are trying to do even though you don't yet know how that's a very real part of the skills we are talking about, you haven't done much group work

All: No

All: No

Ja: Not great design really SAT round a workshop saying which was found it more easy because just found it more easy to project ideas and things and

All: Yes

Ms: The engineers as well

Ja: That was good as well

Interviewer: I'm kind of in favour of you doing a bit more group really it is a kind of it is a bit of a problem

Ja: Quite good if its in isolation to that as well cause like both of those things it was like a week out or a day out and just did it and there was no other sort of student going on nothing else

Interviewer: Yes

Ja: You could really concentrate cause when we did this we had like essays and things

Interviewer: Yes I know

Ja: Wasn't

Interviewer: That's life

Ja: Yes

Interviewer: Be nice one thing at a time but I know what you mean, but that is an interesting point that you've just made actually that I'd like to come back to because I think this business of I think what you said was you could reject ideas more easily if there not your own because you're in a group, one of the things that I think is important actually is this whole concept of the crit, because I think that we are very confused in school about what a crit is for is it for marking is it for assessing is it for teaching is it for getting feedback is it for learning and usually the problem with a crit is that you stand up and defend your scheme so when you're getting criticism you are the least likely to actually benefit from it because you're kind of feeling exposed and defensive, whereas what we were trying to do with the session was to create situations where you were actually not on the defensive but you were also listening to other peoples ideas, and probably making judgements for yourself about whether they really worked or not and hopefully you will have learned quite a lot from that and we've run student led crits I don't know whether you had any of those at all

Ja: Small one, everybody had basically had to do it in the day before and was nackered

Interviewer: Not well timed

Ge: I think the thing with crits in general actually is that they ? handed it it and you had a chance to kind of breath a little bit before you have to present it cause I mean not just from a point of view that you're are physically exhausted but also just from the point of view that it just gives you a chance to take a perspect a different perspective on this

Interviewer: I mean the other way of doing it of course is to do it during the project so you can still do something after the

Ca: That's what I hate about crits because its at the end you've done it and you think that's ? stood there in front of everyone and they're going how can you not have seen that and you're like really insults you whereas if then I had a week to work on it I'd be more firm than have it more then

Interviewer: Yes I think you're absolutely right, make this points to you, you ran one student led crit or

Ja: Sort of yes

Interviewer: Was that done properly in groups and

Ja: Well sort of there were groups I'm just trying to think of what groups were I think it was just get into groups and looking at each others work kind of stuff

Interviewer: No good at all

Mk: No structure to it at all

Interviewer: You haven't seen, a couple of years ago we had we ran an experiment where we had student led crits in groups of twelve with three groups of four you didn't have that

All: No

Interviewer: Ok the idea was that you got into a group of twelve and you had in the group of twelve you had three groups of four so one group of four would pin there work up and each group student would talk about their work for about five minutes at the most, and the others could ask questions but they couldn't comment they could just ask questions, and then that group of four would go away and have a cup of coffee they would leave the room and have a cup of coffee, the other two groups of four were left behind would sit in their group and talk about the four projects and what they thought was strong and weak about them

Ge: This is what we've been doing in first year

Interviewer: Right, well this is the way we designed it, we published a book about it actually, then one person in the group of four would be the spokes person and the four victims come back in

Ms: Victims

Interviewer: And the two spokes people for the two groups of four stand up and say what they think about the four schemes and then they can talk about them and then you change round, now one of the consequences of that is and that's all done in about well the whole things finished in about two hours, plus you've had a cup of coffee inside that two hour period, so what it means is that for the whole of the two hour period you're actually working there's no time when you're not working because you're either making your presentation or you're trying to analyse somebody else's whereas I think the traditional crit you work like hell when you're stood at the front describing it most of the time you're just like

Ge: I think in some ways that was one of the flaws of this project cause when we were each discussing our ideas or it happened quite a lot though we were all sitting together as a group of eight and we were only conveying the point seemed to be we only had to convey information to one person and the rest of us of the group were sitting idle and it did go a bit

Interviewer: Ok so we should have reduced the crit time yes

Ca: It was quite interesting because on the final thing we all knew what was going on and we all knew how they'd worked and how each one of us had done it so you weren't just learning from yourself

Interviewer: Ok, I can see the problem, my feeling was I think we originally had a I think we kind of changed that site didn't we cause our original thought was there were eight of you weren't there

All: Yes

Interviewer: Our original thought was we might get up to twelve people in the group in which case we would break you into groups of four, so you'd hear it but only for three others which would probably be enough, but I think we changed that because of the longer ? some ?? one of the problems with any group learning technique is it depends on the group playing the group one of the problems these days is say you've got a group of four and one student doesn't turn up it really messes the other students about and that actually happens quite commonly, so I got worried about that, ok anything else this afternoon we haven't talked about that you want to, cause you're going to talk

All: Yes

Interviewer: We are really grateful for a bit more of your time because we are trying to pin down some of the key issues behind this project, and that eventually will be published, not mentioning any of you by name, but the idea is

to try and move this on develop this technique as a what we are trying to do is to develop tools that helps you to learn about processes when you learn about product but at the same time in a different structured kind of way this is just the first attempt really, ok so the message is it was ok, didn't like the break in the middle because of Easter, it was about the right length, we got the project about right in terms of the sort of building, maybe should have been slightly smaller groups, but it was quite it was fun, and worth doing again, but we mustn't tell them what's going to happen, ok so if we do do it again don't any of you tell them. Ok right thanks very much.

II. Final Group Interview

Researcher conducted the final group interview after one year of completing of the project.

Interviewer: OK now that's the beginning of the last group interview with the student.

Interviewer: So what we are going to do actually this evening as simple as that just to get your feed back about what we did last year almost now around eleven years now eleven months actually from the experiment we did last year so I want just to get your feed back and what you think about it and if I can make some kind of you know that would help me actually ? interview that we want to present the comment the idea just say your name I'm George or so I will ok this person will sit there if that is ok, just we will go what we did last time what we did actually we made a kind of experiment in a project for around five weeks ok and the tool we call it ALT and its aims are actually to improve student design practice and allow them to learn from their design experience to improve the student design practice I believe as a researcher we have to improve how they conduct a design and how they present their design and how they discuss with others their design practice, the ALT has three main parts and I am sure you remember first one the construction the design action try to segregate it in the front part naming, framing, moving, and reflecting, and then tried to replicate other student design action that sheet and then try to redesign it again so those are the three main part of the ALT that we went through in our experiment. Now the main ? actually and for this interview just to get your feed back about that, now almost you've had three design project after our experiment, am I right around three

All: Yes

Interviewer: what do you think during the past design exercise has have you ? to use actually any thing from our tool ALT is our as a whole or as a portion some of course ? element do you think our did you actually use some of those or do you find it useful actually again and again to you know assist your design practice or to improve it I want to hear name from you as a comment and then we can go and detail some ? so who want to start you say your

De: I think what I did actually for this years actually do a big sketch setting down the concept of ? ideas in two big sheets so I can actually follow up do some follow up work on that sheet to the main accurate designs and seems quite useful

Interviewer: So did you do you mean a that you did your sketches of a concept on a work sheet and then tried to trace it forward

De: Yes representation of myself so I can actually go back to that big sketch and see what happened and what happened ?? design process

Mk: I think I maybe a bit more organised about my working and looking back at how I structure sort of design stages and such and some quite basic things like dating my work which I picked up but also sort of looking at it when I've made breakthroughs and things and when I've made successful moves and things so it's a lot easier to identify and sort of talk about and talk to the duties because I can say that's a distinct move so

Interviewer: The same phrases

Mk: Yes to some extent but just to think about it in those you make breakthroughs and then you have problems that you have to ?

Ge: I think it helps to kind of its helped having motions of isolating problems and restricting what you are trying to do to what you see as the main concerns for from a brief or a project a problem em so you are not I mean there's always implement things of things that you could address but in kind of em yes identifying what those main issues are it helps you to kind of give them the kind of priority of your attention and em then that strengthens the results that you get from having done it

Ms: em that's a good point actually because at the moment the past few projects that we've done since the fairground project they've all been pretty short projects so because you've got such a short amount of time you can only focus on a certain amount of things and so from going back to like the fairground project where everything was kind of like not into categories but everything was set into stages and different problems were looked at separately you can yes you can home in on like the important things and concentrate on those especially with like such a short time schedule so we were never obliged to try and solve everything.

Interviewer: So do you think that's organised or design or

Ms: Yes sort out enough its just so easy just to start doing something and then like go off on a tangent on one thing and then go off on another direction and become really separated from all the issues its just like tying to follow everything al together so em yes just so you can focus on problems that way

Ja: em I don't suppose I would have taken on the language that we sort of talked about during the project but more so the processes when you sort of come to a bit of a problem stepping back from it and trying to identify what that is so you can concentrate on that one issue and sort of try and solve that and all sort of its things like framing and things I wouldn't have thought of covering in the terms we actually used were its more the process

Interviewer: What we have asked is for every body to give us their feed back of the last two projects you did after the fairground and did you try to you know utilise the some of the particulars that we used as a whole or just specific to naming, framing, moving, reconstructing or reflecting about something or ? so but say your name first and then

Lu: and I've used kind of a technique of the narrative we used of kind of giving the particular em names to certain parts of the void as I see as I used on the fairground project to kind of name the thing model unit just like give it a name I've done that again actually and also the model unit project this just the womb of building and this is the em I've kind of I've treated it like body basically and I've done that again with the last project where I did the station and I've kind of named the station hall all kind of the entrances and all the ramps to all the platforms and the train floor because I imagined the place to be busy as the train floor for stock exchange so I've kind of given a name to it just to

Ms: yes that really helps when you're trying to describe a project and your concepts to somebody who hasn't seen your project before kind of thing to give it a name but I suppose maybe in practice that might cause a if you are to actually build it you would expect your users of the building to give it the same name its just a technique of explaining your projects to someone, you wouldn't expect a train user so well I'm just going to go to the training floor of the station or anything like that so that helps when you are trying to get your ideas across to someone who is not familiar with what you've designed

Lu: And actually also just I have also used for the last project which was in Glasgow intervention where I did something which looked a bit which was a carve I just called it the wave and a space within the tunnel of the wave and like this space is what ever front faced away and back faced a wave

Interviewer: When you try to organise your if we can call it your design practice during the ? did you find that the current studio practice actually prevent you from doing that so because the design tutor want you to go to use this steps instead of other one so you don't have time actually you mention you don't have time to reflect about something because you have to now produce the sketches and did you find that there is some constrain actually in the design studio practice that did not allow you to do it as what you wish and like I lost

Mk: I think there is but I don't think that is necessarily a process that ?? I think that is just general time limits and things and the way that we thought about it in the fairground which then it wasn't very long but it felt like we spent a reasonable amount of time on sort of the concepts and such rather than the more pragmatic issues so it was an opportunity to kind of explore some sort of more theoretical in some ways which I think maybe can get waylaid when you're doing it in the studio but equally I don't think that's a I think that's just cause you've only got a

certain amount of time to design something you can always spend a bit longer on developing the concept of things em and I don't know whether that's the difference between this method and another method or whether that's just a case of you have to get the design to a certain stage before taking it to the next level

Interviewer: Yes, so yes but if you try to improve your design practice did you think that there is other thing that you have to include in it in our tool that could help us instead of just ? the design process into different stages and try to look at it again do you think that there is better way that's to do with so you can at least improve your design skill and

Lu: The project at the moment you have to do like site and city analysis and what I was not very happy about was that we couldn't choose the methods we wanted to kind of do the analysis and I'd rather kind of be able to now where we've done it already once to kind of choose a kind of method I think is appropriate for my approach to analysis city rather than have to do what you're told but on the other hand at the same time you are learning so

Ms: Yes the meant to do one thing and the other thing because you maybe haven't tried it before so its

Lu: I do the same anyway I'm doing the same as I did for the last project same type of analysis I probably would rather do something else

Ms: I think it was em the way when we did the fairground project was when we designed it up to a certain point and then passed the design onto somebody else to take over and develop it which is wondering maybe what it would be like to have two people on the same project from the same starting point to the same end point because its like I passed my design on to Lutz, but he didn't complete it, but I got George's and I kind of like really I suppose I really changed it didn't I, I changed the whole materiality of it and I was just wondering if maybe if you were there like looking over my shoulder all the time and you gave your comment as I was designing would it have been enough to persuade me to do something else or something do you understand what I mean. If you really objected to what I was doing and you could see what I was doing would you tell me no don't because you[re really attached to it or something.

Interviewer: We actually discussed this with Brian actually in the beginning that why not just you know what each two students would with each other so that they can change that one and if it was that in order to let the student to try to externalize their design process with let them being with different more than two minds for example will you give your project to him and take hers actually so this means that you have to talk to him and how he understands and the same to him actually how he be so that will expose the students to different design mode because each one of you of course has your own way of designing, has their own way in

approaching the design problem and has their own technique so that is why I want to explore the students to as much as we can to give at least feed back and how we approach a project of something and that is the reason I should be here, not only to work with each other from the beginning of the day tell the end. Now when we talk about the understanding the design problem did you find that the total when you get the design brief and you discuss this with in term of trying to identify the main object the main point in the problem of the brief and try to identify the characters I think we did actually did you try to use that one or just you know and try to read it and try to interpret it and then just propose the solution of your concept or something like that,

Ja: I think we generally used the approach where we talk it through before or personally I would normally got to the first tutorials without very much of an idea and generally just listen to other peoples I'd kind of try and keep it as open as possible and at the start sort of which I think was the same kind of approach that we kind of more kind of discussed it rather than actually designed something I think that is something that I do normally do anyway.

Ge: I think its quite difficult to see how the kind of the things that we learned have been applied because there was such a big time gap between doing the fairground project and do it the next design project but em and so it kind of feels like the things we learned kind of become almost like the are automatic rather than I mean not that you know we've just learned things and we just do them automatically but but almost like that, but you just kid of learn things and you then you just do they become more natural processes and so you're not thinking oh I'll have to identify this and I'll have to do this and do this like and like look at the process to see what to do next, because you kind of it just starts to become a more natural way of thinking about things

Interviewer: Yes I agree with you this is what we call it actually there's the different between a episodic and semantic and semantic knowledge the first one as if you are how to drive a car the first thing that you have to watch is that and then after then you cant drive it for your self its not easy know how to press this so this is the episodic knowledge you can call it and the other one like or example is the science for a math or physic something like that you have to go to your mind what is the next stet so ask yourself and then you conduct the action like that and that's the most of architectural education in school they try to do that one to stress or embed these skills in the cognitive system of the students so they will do it like that without even think about ok so that's it how you do it ok I have to explain but after I've done so that's the reason I ask you to of course we are not asking you to explain ok then I have to identify that one and then name nobody can do it like that it will be smoother but would look at it again oh yes I did that because I have identified that's the main thing in that one ok you'll try to rationalise it after you do so something like that so that's a normal way actually. Do

you have any general comment actually of that time help actually and develop that one to be more practical or something like that.

De: As a student you can only read the method actually kind of interest that you can actually describe the design process because for my station I actually kind of stepped into identifying and framing the problems like kind of looping again a again and it really took ages before I step into where I can rationalise my design process and I think probably certain wouldn't have time to kind of push it forward then

Interviewer: When you prepared your portfolio The last year or this semester Did you find useful to you some of those when you are explaining your ideas even without learning the techniques just you know see whether you get it any different so it will be clearer what you are proposing did you find anything of that useful

Ja: I've done more this year in sheet concept sketch or something and then a sheet which is a design sheet which is deliberately sort of messy and sketchy and things just not really as you say not really explaining not saying these are the stage just bits and key sort of things that happened and the important sketches and important things that I felt were ? design just I don't know if some read my portfolio which understand that it was necessary but if I was explaining to somebody I could show them the development of the process and show that it wasn't just a building plot that it had a process behind it a system to my design

Interviewer: Any comments any additions or so what it look like and the design set up or the studio set up set up not allow most of us be free actually choosing their own method and try to cause they are rushing just to produce the concepts to present to them actually of just evolving more and more you get my point.

Lu: I think we had quite a lot of freedom like for the first project we had the choice between five different briefs and we could choose our own sites within an area that was another free element and we could also kind of each of the five different briefs there are quite a lot of freedom in interpretation and now for our last project the one that's coming up we can actually write our own brief and we got a large area again where we can kind of pick the site and I'm sometimes I mean I'm happy with it now because I've got an idea but sometimes I think its maybe a bit too free like too little constraints to little I don't know boundaries where you can orientate yourselves on

Interviewer: How do you find your self actually in the design crit can you comment cause you are following some step or do you find other people actually clear and explain their ideas instead of just

Ja: It depends a bit on the project I think I had since the Fairground one I've done one in Glasgow and one in Manchester and the Glasgow one I had a strollen concept and a very straight forward process that was very clear

to the number of stages and I thought it was very sort of one guiding idea one sort of things that fell into in at certain stage of something so it was I found I could explain it quite easily and I think that went well and very simple and the second project that I did I felt I was a lot less focused I think it was not as good a building at the end of the day but when I did the correct things a lot harder to explain because it didn't have what I think the process when I designed it wasn't as good it wasn't as strong so when I was trying to explain the idea and how the ideas had built up they were very fragmented they came from all over the place and it was a lot less easy to stand up and say this is how it developed this is all it is so I think if you've got a strong process you can use the process in the correct to explain what you've done where as if you've got a slightly suspect process it's a large harder to sort of keep your train of thought and keep the discussion going.

Interviewer: Did you explain your project to other student or design tutor during the desk crit did you find its become a little bit more organized to your self or just talk about it in general like normal desk crit how do you find it

De: Everything is solid in your mind so its easy talking about it its just a matter of writing down notes which help to describe and I think tutors are really concerned about the design process ? your own design technical stuff and that sort of thing,

Interviewer: That's it so are there any comments thanks a lot and I wish you luck in your studies, thanks

Appendix C: Experiment Project

THE FAIRGROUND

National Fairground Archive Interpretation Centre

The empty field; vacant ground. The arrival of the travelling fair momentarily transforms a town. Coconut shies and candy floss; throngs of people, consumers and participants, enjoying the rides, the noise, the excitement. This is a staged architecture. A temporary occupation of space and place. The fair's iconic forms – the helter-skelter and the merry-go-round – all too easily dematerialise into their component parts, carefully packed up and crated ready for transportation to a new destination.

The University of Sheffield houses a unique collection of fairground ephemera: The National Fairground Archive. Chronicling the lives of showmen, the collection comprises photographs, drawings, handbills, personal recollections and many artefacts. To access the richness of the archive an interpretation centre has been proposed, open to scholars, school parties and the general public as a permanent fairground attraction. You have been invited to design a small pavilion in Western Park to house the new centre. This building will become one focus for the regeneration of park life and will need to be resilient and secure while remaining accessible, inviting and evoking 'all the fun of the fair'. From time to time it will become the centre of an actual fair, colonising the park grounds of Western Park.

The National Fairground Archive

The National Fairground Archive forms part of the Special Collections and Archive Division of the University Library. Housed in the Main Library, the NFA collections are continuing to grow: There are now over 30,000 images in the photographic collection, in addition to audio and video material, journals and magazines, nearly 300 monographs, programmes, handbills, posters, charters and proclamations, plans and drawings. They covers all aspects of the culture of travelling showpeople, their organisation as a community, their social history and everyday life; and the artefacts and machinery of fairgrounds.

The NFA represents an important part of the cultural heritage of the nation. It is a primary resource of rich potential for research at every level; it provides a new and exciting source of teaching material for primary and secondary education, and provides access to a wealth of popular cultural history both for the Fairground enthusiast and for the public at large.

All of these collections are currently being catalogued and conserved. A computerised database has been set up, and with digitisation much of the source material will be accessible on screen. The Archive can currently be visited in person or through the site on the World Wide

Web and since its inception it has been consulted by a wide variety of visitors and has handled a diverse range of requests from as far afield as Australia and North America.

To raise the profile of this nationally important archive within the city, the planned interpretation centre will house a changing exhibition of fairground ephemera and provide search facilities and a study base for visitors, scholars and school parties. One full-time member of staff will run the centre, manage the exhibition spaces and liase with local schools. The main body of the collection and its archivist will continue to be located within the University Library. Details of the Archive's current holdings that might be used as exhibits are listed below:

- **Serials**

  11 titles including the *World's Fair* and *The Fairground Mercury*
- **Monographs, articles and manuscripts**

  200 items covering all aspects of showland life
- **Photographs, postcards and drawings**

  c.21,000 photographs and postcards (black-and-white and colour) in various formats, 1860s to the present day including the R.A. Taylor Collection (24 albums) and the Jack Leeson Collection (18 albums)
- **Video cassettes**
- **Audio cassettes**

  Interviews with showpeople and fair organ music
- **Correspondence**

  c.150 letters including the R.A. Taylor Correspondence
- **Newspaper cuttings**

  Many hundreds of cuttings from newspapers and magazines including collections made by the Bird and Shufflebottom families
- **Cash and account books**
- **Trade catalogues**
- **Bibliographies and catalogues**
- **Handbills, proclamations, posters and programmes**
- **Diaries**
- **Maps, charts and plans**
- **Calendars and almanacs**
- **Teaching material**
- **Miscellanea**

  c.70 items of ephemera including membership and invitation cards; fairground ride tickets; insurance certificates; letterheads; and transport registration books

Site

The interpretation centre will be situated on the site of the recently demolished glasshouses in Western Park (see plan), and should occupy an area no larger than that defined by the existing perimeter hedging. The floor area and orientation of the new building is at your discretion.

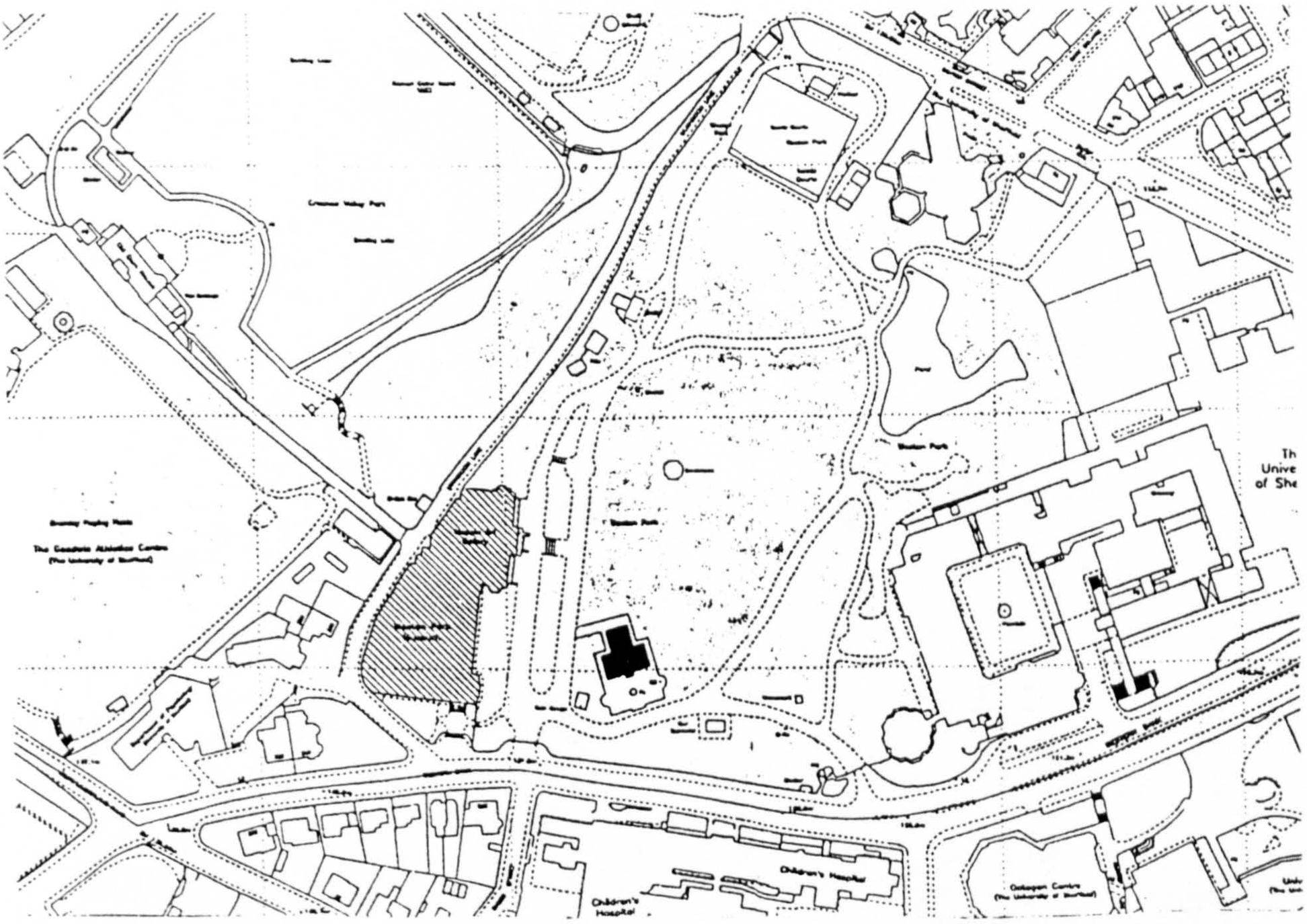
Schedule of accommodation

The new building will include:

- display area / exhibition space (this could include external areas)
- seminar room for up to 30 also suitable for craft and project based activities
- study area with up to 10 computer terminals, workspace and a small reference library
- office / reception
- lockers
- kitchenette
- toilet

The exhibition should be publicly accessible; research areas and the seminar room to have a greater degree of privacy / security. As a pavilion in a public park the building must be secure at night and approachable during the day.

Working in conjunction with Professor Bryan Lawson, your approach to a design resolution and ongoing client stipulations will be an important part of this short project, and we will encourage you to record, document and criticise your architectural intentions. Please keep all your design sketches / sketch book as these will form part of your final submission.



Timetable

Monday 26 March	10 am	Project introduction with Bryan Lawson
	2.15 pm	Visit to National Fairground Archive with Vanessa Toumlin. Meet by the turnstiles in the University Library. Studio session (groups)
Thursday 29 March	2 pm	Studio tutorials
Tuesday 3 April	10 am	Interim presentations. **Requirements:** sketch scheme with plans and sections / elevations and model.
Thursday 5 April	10 am	Tutorials
Monday 30 April	10 am	Tutorials
Friday 4 May		Final Review

Watch the notice board for any changes to the programme.

THE FAIRGROUND

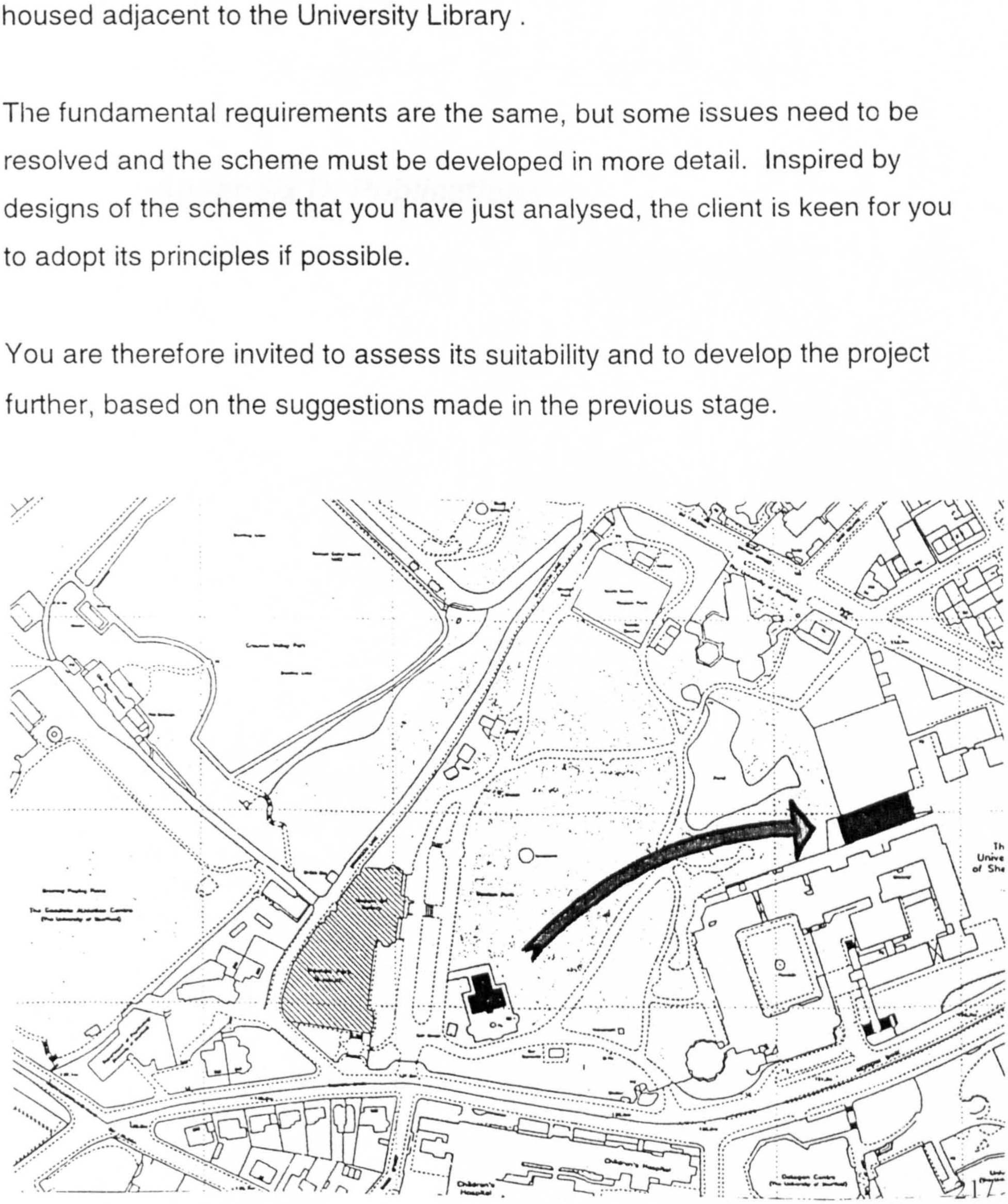
REFLECTION AND REDESIGN

Following your deconstruction and analysis of the design process, the final phase of this project introduces a radical change of scenario.

The client is pleased with the range of designs, and has decided to proceed further. However, they are faced with a dilemma -- the chosen site in Western Park has been deemed unsuitable and the interpretation centre is now to be housed adjacent to the University Library .

The fundamental requirements are the same, but some issues need to be resolved and the scheme must be developed in more detail. Inspired by designs of the scheme that you have just analysed, the client is keen for you to adopt its principles if possible.

You are therefore invited to assess its suitability and to develop the project further, based on the suggestions made in the previous stage.



Appendix D: Publications

Paper Title: Architectural Learning Tool: Encouraging students to learn from their experiences

Conference Name: Re-inventing design education in the university

Date: 11-13 December 2000

Location: School of Design, Curtin University of Technology
Perth, Australia

Source: Conference Proceeding

AN ARCHITECTURAL LEARNING TOOL

Encouraging Students to Learn From Their Experiences

Ahmed A. Bakarman, *Ph.D., Candidate, School of Architectural Studies, University of Sheffield, Sheffield, UK.*

Abstract:

The target of this ongoing research is to develop an architectural design-learning tool. This tool aims to enable architectural students to learn from their previous work, build on their experience, and improve their design skills. The main argument of this research is "How can students learn from their previous design activities?" This argument emerges from the identification of the sources and means of professional knowledge and design experience in the design studio. These means are the studio tutor and practicing designers. This research proposes the student's prior design experience as another means. Reflection upon prior experience is considered an avenue to integrate the new means with the existing two. The new tool builds on an integration of the "Experiential Learning Theory", and the "Reflection-in-Action" paradigm in describing design activity. The current status of the research is:

1-Developing an experiential learning model.
2-Proposing an architectural design-learning model.
3-Proposing a new design studio setting.

Keywords: learning tool, experiential learning, reflection techniques, and teaching models

Introduction:

The design studio, as the backbone of architectural education, attracts the researcher's attention for many reasons. One of them is the richness and complexity of this learning situation, and the amount of disciplines that have been integrated into and interact in such an environment. As the design studio is considered as the setting of "learning by doing", (Schön 1983), (Biggs 1999)and as the core of architectural education (Bunch 1993), this environment allows the student to develop design skills, acquire professional knowledge, and explore appropriate professional, social, cultural attitudes (Nicol 2000). The environment of the design studio is formulated on the basis of a close relationship between the studio tutor and the student (Fisher 2000), in which the medium for such a relationship is the design conversation (Schön 1983). This conversation allows the student to gain professional knowledge and develop design skill, which is considered the essence of the design process. Even though the learning setting provides the students with the opportunities to expand their professional knowledge and develop their design skills, it does not allow them to participate as actively as they should. From the literature review, the researcher has identified that the means for professional knowledge and design experience, which are considered the sustainable fuel for design activity, are limited to the

studio tutor and the practitioners. Therefore, the student's prior professional knowledge and design experience (PKDE), which have been accumulated through the their school training, have not been activated in full mode during the design activity. So, the research aims to answer the following questions:
1-What is the potential role of the student's PKDE in the design studio practice?
2-How can we, as educators, integrate this means into the studio's educational system?
3-How can students improve their learning activities and develop their design processes and practices if they reflect upon their prior design activities?
To answer these questions the research sets many objectives such as:
1-Integrate the approach of learning from experience with architectural education.
2-Establish a position for the student's PKDE in the design studio practice, and consider it another means for professional knowledge.
3-Increase the possibilities for student participation inside the design studio.
4-Propose the process of reflection upon prior design experience as a means for developing the student's design process and practice.

To fulfil these objectives and formulate the required tool, called "Architectural Learning Tool (ALT)", we have to highlight many aspects and investigate other disciplines related to the subject, which will be described in the following sections. To test this tool we have to apply it in a real design studio, which will be the second part of this research. The empirical study could provide valuable feedback to formulate the final version of the ALT. In addition to that, the experiment's subjects have to accumulate a certain quality and quantity of architectural knowledge and design experience, therefore, graduate or undergraduate students in advanced stages could be the most suitable group to use and apply such a tool.

Learning and Teaching Process:

Any educational setting consists of two actions: learning and teaching. While some researchers claim that the distinction between the two is not clear (Nicol 2000), others described the teaching setting as an environment in which the students act as recipient, while in the learning situation the student is an active participant and the teacher acts as a facilitator of the learning environment (Fenstermacher 1986) (Dinham 1989) (Clayton 1965) (Prosser 1999) (Ramsden 1992). Considering the learning environment as an active situation, where learners will participate actively to formulate their learning situation and modify their behaviour accordingly, there are two main theories of learning which represent the different perspectives of the learning activities.

The Constructivism Theory: *The idea (of constructivism) reset on the notion of continues building and amending of previous structure, or schemata, as new experience, action and knowledge are assimilated and accommodated ..... Constructivism tells us that we learn by fitting new understanding and knowledge into, with, extending and supplanting, old understanding and knowledge .....Without change or addition to pre-existing knowledge and understanding, no learning will have occurred.* (Fry 1999). Based on this theory,

Kolb defined the learning process as: *Learning is the process whereby knowledge is created through the transformation of experiences* (Kolb, 84).

The Phenomenological Theory: "*The essence of this view (Phenomenological) is that, meaning is constituted through an internal relationship between the individual and the world. Learning is about experiencing the object of study in a different way, where the experience is a relationship between the person experiencing and the object experienced.*" (Prosser 1999)

Characteristics of Students' Learning Process:

The view of the learning environment as a setting for acquiring knowledge and developing skills, emphasises different characteristics, which differentiate the new view from the traditional educational setting:
1-The learning activity is considered as an active, constructive, and goal oriented process, which relies on the mental activities of the learners, (Shuell 1986).
2-We can not expect major modifications of existing knowledge and experiences, the modification could be partial, (Shuell 1986).
3-The learning process is considered as accumulative, so any learning action cannot be considered an isolated act.
4-While students construct, organise, and re-organise their own knowledge and experiences, they are interacting actively with the new information in order to own it and make it "personally meaningful", (Nicol 2000), which may modify their conceptual framework, (Biggs 1999).
5-This constructive view of learning activities, in which the student is modifying, revising, and relating ideas to each other, places the student in the centre of the learning environment, (Nicol 2000).

A New Approach in Architectural Education and Design Studio Practice:

The Nature Of architectural design and modern learning theories:

In architectural literature, there are two main paradigms in describing the design action, (Dorst 1995). The first paradigm considers design as a "rational problem solving process", (Simon 1992) This approach is part of the information-processing model of cognition theory, (Eastman 1968).

The second paradigm considers the design action as a process of "reflection-in-action", (Schön 1983). This paradigm describes design action as a reflective conversation between designer and situation, (Dorst 1995), and the design process consists of naming, framing, moving, and evaluating processes. The solution, which emerges from these processes, is built upon the professional skills of the experienced designer, which were acquired during school training and professional practice. Schön's approach aims to describe the design activity as experienced by the participant, and build upon the constructivism theory of learning, (Dorst 1995).

Means for professional knowledge and design experience:

As in Schön's approach, the means and source of design ideas and solutions are the professional knowledge and the design experience of the practicing designer. In the design studio, the studio tutor joins the practitioner in this role. In addition to that, during the school training, the students accumulate reasonable quantities and qualities of professional knowledge and design experience (PKDE) which should be considered as another means in the design activity. The student's PKDE is considered by some researcher as the "frame of references", in which the student refers to them in any design situation, (Hertzberger 1991). Others consider them as a "reservoir tank" (Laxton 1969) which acts as a source for design ideas. (Lawson 1990)

The essence of engaging the student's PKDE is not only to activate the student's participation, but also to expand and improve their PKDE. The means for doing that is: by conducting continuous and systematic reflection actions upon the design experiences and past actions. Reflecting upon the student's own experiences allows them to learn from their own mistakes and increase the value of their experiences, as Lawson argued, "Learning from your own mistakes is usually more powerful than relying on gaining experience from others!" (Lawson 1990).

Experimental Learning Theory:

This theory was developed by David Kolb, and builds upon the works of Dewey, Lewin, and Piaget, (Kolb 1984). The theory emphasises the role of prior experiences in enriching and enhancing the learning activities. The main part of Kolb's theory is the learning cycle, which considers reflection upon past experiences is an avenue to develop the learner's abilities. The learning cycle consists of four stages:

Immediate concrete experience is the basis for observation and reflection. These observations are assimilated into a "theory " from which new implications for action can be deduced. These implication or hypotheses then serve as guides in acting to create new experiences (Kolb 1984).

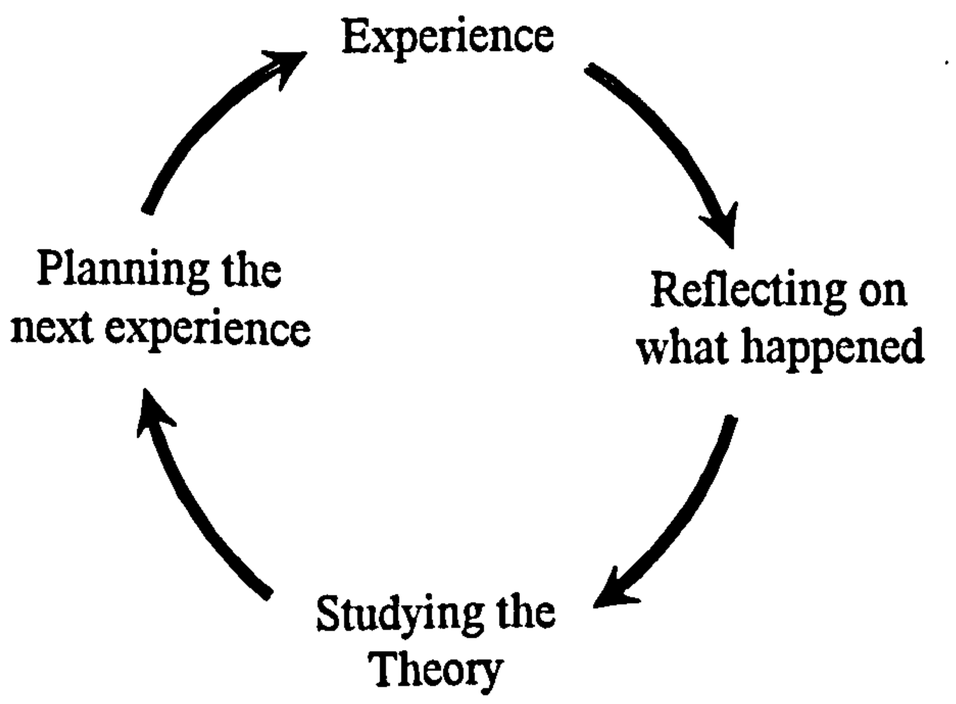


Figure-2: Kolb's Learning cycle

Characteristics of the experiential learning theory: (Kolb 1984)

1-Learning is best conceived as a process, not in terms of outcomes.
2-Learning is a continuous process grounded in experiences:
3-The process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world.
4-Learning is a holistic process of adaptation to the world.
5-Learning involves transactions between the person and the environment.
6-Learning is the process of creating knowledge.

Reflection upon Experiences:

The second stage of Kolb's learning cycle is the reflection action. This stage aims to re-evaluate the learner's past experiences and identify any important aspects which could improve the learning situation. The reflection action is considered as the: *"active process of exploring and describing which often leads to very unexpected outcomes." (Boud 1999)*. And its importance can be deduced as "*Any experience which is not followed by reflective evaluation will be quickly forgotten, and its potential will be lost*, (Gibbs 1988). On the other hand, in the architectural profession, mainly in the design studio, the reflection action has an interesting role, where the student, during the reflection stage, might identify the strengths and weaknesses in his/her design practice, and discover missing opportunities which may provide the student with important materials to improve and develop his/her design skills, (Cotton 1995).

The reflection action can be divided into two types, (Schön 1983):
1-Reflection-in-Action: this type refers to immediate feedback during or after the completion of the action (Quayle 1989).
2-Reflection-on-Action: this type refers to delayed feedback and to reflection well after the act is completed (Quayle 1989).

In addition to that, the reflection activities have three stages, through which the learner has to pass to ensure their effectiveness. These stages in sequence are: Returning to experience, Attending to Feelings, which consist of two acts: utilizing positive feelings, and removing obstructing feelings. The final stage is Re-evaluating Experiences. For these stages to be accomplished in a meaningful manner the experience has to be memorized, recorded and captured, so the learner can reflect upon some solid materials which represent the actual experience. Beside the student's abilities to memorize the event, the experience can be recorded via several techniques. The most popular two, for architectural students, are the sketch book, and visual recording techniques, such as video recording.

Architectural Learning Tool (ALT):

ALT, as a learning tool, aims to activate the students' participation in the design studio via their PKDE, and provide them with a new learning model and a reflection technique that may improve their learning ability, develop their design process, and enrich their learning environment. From the literature review, the researcher has identified several teaching/learning models (Salama 1995), where

each model was invented and developed to respond to specific needs and different aspects relate to professional practice. In addition the researcher has identified different reflection techniques (Quayle 1989). Therefore, one of the existing teaching models, the Concept-test model, will be adapted (Ledewitz 1985), and integrated with a selected reflection technique, the design Re-think and Re-draw technique (Quayle 1989), and modified to formulate the ALT's learning model.

The Concept-Test Model:

This model was developed by Stefani Ledewitz, (Ledewitz 1985), and contradicts the traditional design-thinking model, analysis/synthesis, and proposes the concept-test model instead. Ledewitz argued that analysis/synthesis mode divided the design process into two separate stages, and as a result of this separation, students thought that the creative leap occurred as a result of the completion of the analysis stage, (Ledewitz 1985). The author argued that, in the architectural design studio, the student learns three basic concepts:
1-Learn and practice new skills.
2-Learn a new language to explain and present their ideas.
3-Learn to "think architecturally", (Schön 1983).

These three aspects are being learnt, in the design studio, not as separate entities but as one whole system, and students learn and practice all of them at the same time, (Ledewitz 1985). The Concept-Test model perceived design as a development process that interconnects the activities of conjecturing and testing, or what Zeisel called "imaging, presenting, and testing", (Zeisel 1981).

Students begin the design process directly by proposing a tentative concept, which could be generated depending on the basic project information and the designer's professional knowledge and experience, which acts as "primary generator" (Dark 1978) then, this concept is presented and tested. These processes of imaging, presenting, and testing, (Figure-4), could encourage the student to engage his/her prior experiences and knowledge and identify the need for additional information. So, the main issue in this model is the "incremental information" in which the student starts the design process with minimal information to generate the design concept, or image. The information could be acquired via three sources (Kolb 1984): student research, formal lecture, and handout that respond to the students needs. These sources represent the need of the whole class, but individual needs could be treated individually.

The usage of prior experience and design knowledge is a kind of reflection-on-action and delayed feedback, and the process of imaging, presenting, and testing, on the other hand, is a mode of reflection-in-action.

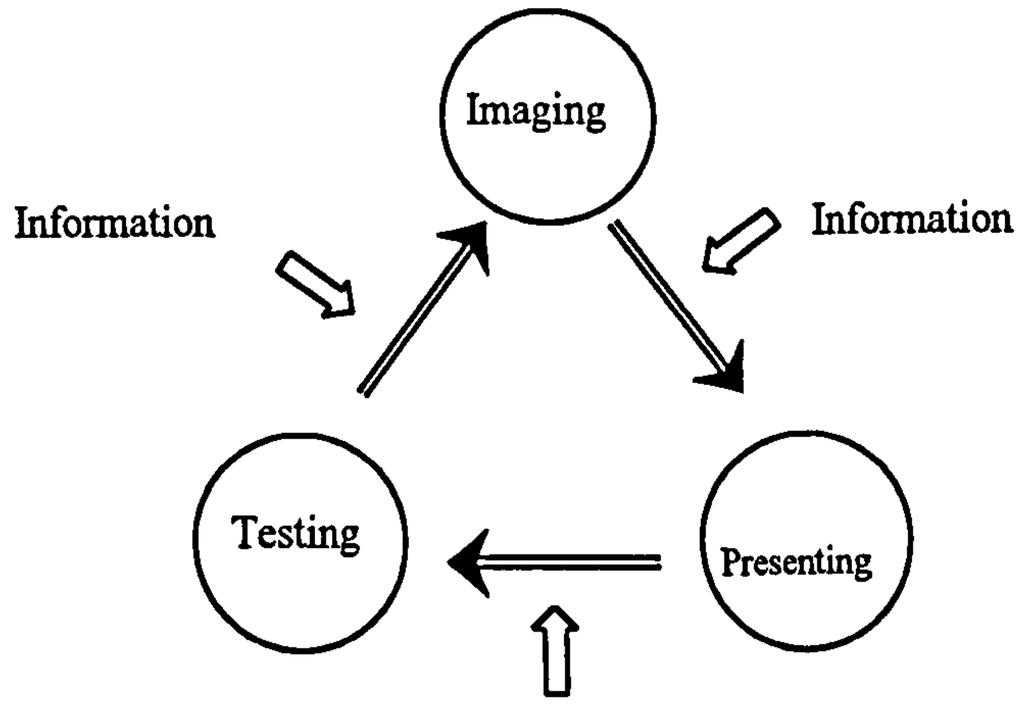


Figure-4: The Concept-Test Model

"Design Re-Think and Re-Draw" reflection Technique:

This technique was developed by Mura Quayle (Quayle 1989), and instructs the student to return to a completed project, at least after four weeks (Quayle 1989), with the intention of developing it to satisfy new requirements, or re-doing it with a new design approach. This technique can take several formats, the student may exchange a portion of his/her project with another student and try to revise it or develop it in more detail, or change the scale of a portion of their own project and develop it in more detail. The author argued that such a process, re-thinking and re-drawing, could allow students to re-enter their design from a different perspective. (Quayle 1989)

Experiential Learning Model:

An experiential learning model is developed for the new tool, which is an integration of Kolb's learning cycle and Dewey's model of experiential learning. The advantage of Dewey's model is the helical movement that overcomes some problems of Kolb's cycle (Whitaker 1993). The helical format allows the student to connect new experience with the experience preceding it, and employs its outcomes as delayed feedback that could enrich and improve the new experience. The experiential learning model of ALT could be described as, (Figure-6):

1-Designing "Reflection-in-action": In this stage, while the student is involved in a design activity his/her cognitive process continuously proposes, presents, and then tests a concept with reference to prior experience and knowledge (Hertzberger 1991).

2-Meta-Reflection: After the completion of the design task, the student has to recall the event, and conduct a reflection on the design task via the design's media. The reflection on the design event aims to extract certain aspects, such as
A-Identifying missing opportunities and ignored design approaches.
B-Identifying strengths and weakness in the student design practice.

C-Identifying the need for additional information, which may improve the design condition.
D-Re-considering the student's prior PKDE for improvements and modifications.

3-Acquiring Knowledge and Formulating the Theory: After identifying the necessity for new knowledge and ideas the student could acquire knowledge, either by consulting more experienced people such as the teacher, or consulting written references. After acquiring the required knowledge, students have to interact actively with it in order to own it and make it personally meaningful.

4-Re-Designing: By re-designing the same project with a new intention and design approach, the student could learn and benefit from his/her previous design experience and re-evaluate their experiences.

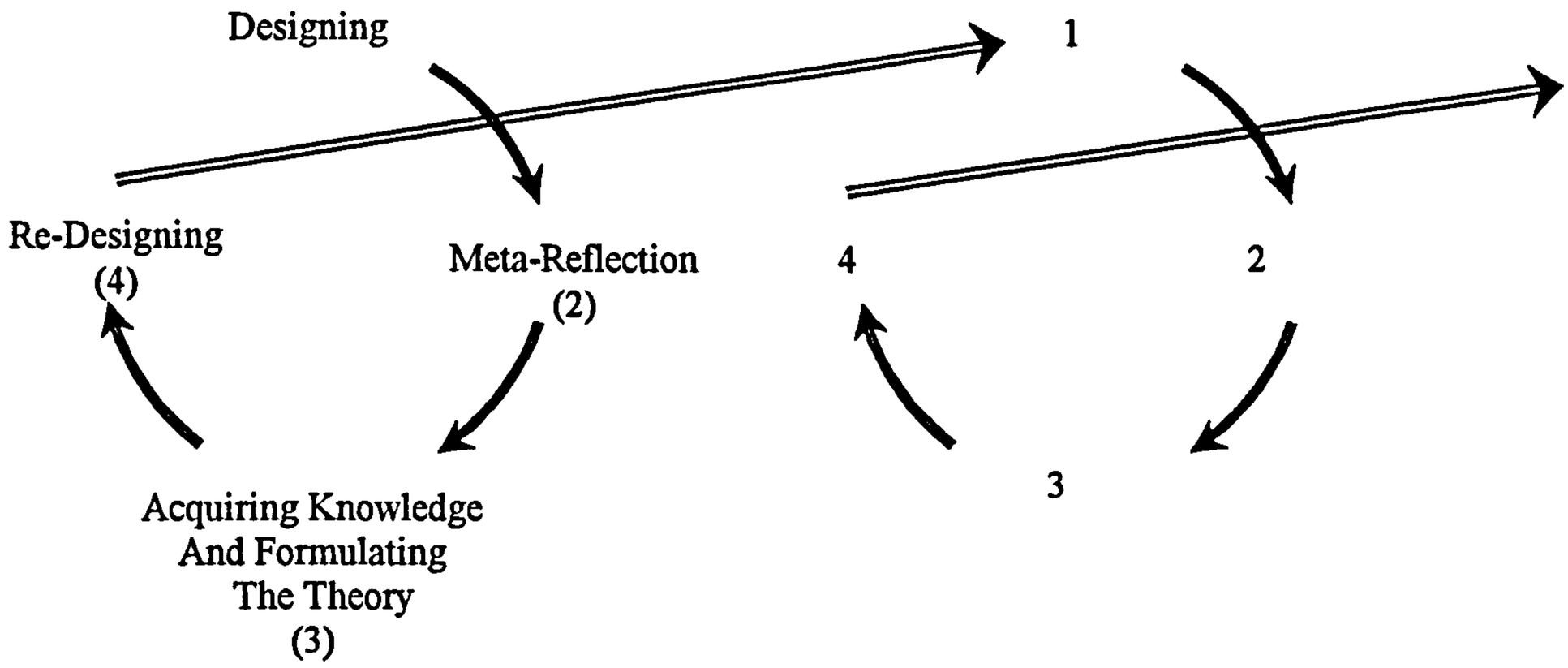


Figure-6: Experiential Learning Model for the ALT

Designing the Design Studio:

As practical application for the ALT, I have developed a new design studio setting. This setting determines the number of projects in each semester, and the procedures of the design studio. There are two projects in each semester, project A and B, and each one is divided into two phases. The first phases of each project follows each other in a sequence and are then followed by the second phases in the same manner. The first phase is considered as a reflection-in-action, and the second phase as a reflection on the reflection-in-action, "Meta-Reflection", (Figure-5).

During the first phase of project A, the student commences the design process by following the concept-test model procedure. After completion of the first phase of project A, the first phase of project B starts with the same procedure. The aim behind such a shift is to get the student out of the mode of project A by engaging them in another project. After completing this phase, the student returns to the first project to commence the second phase. The aim behind returning to the completed project is to apply the technique of "Design Re-Think and Re-Draw". At this stage, the student considers the completed phase as prior design

experience, and to re-do it they have to rebuild it again. To rebuild the event, the student has to consider the experience recording techniques and design media as reminder aides. At the end of the second phase, the student can conduct a comparison between the two phases.

The same procedure applies to the second phase of project B, with one variation, that the student could exchange his/her project with another student, and each one re-does or develops the other student's project with new intention and design approaches. By such an action, the real designer has to make explicit his/her design decisions and work hard with another student to re-build the design event.

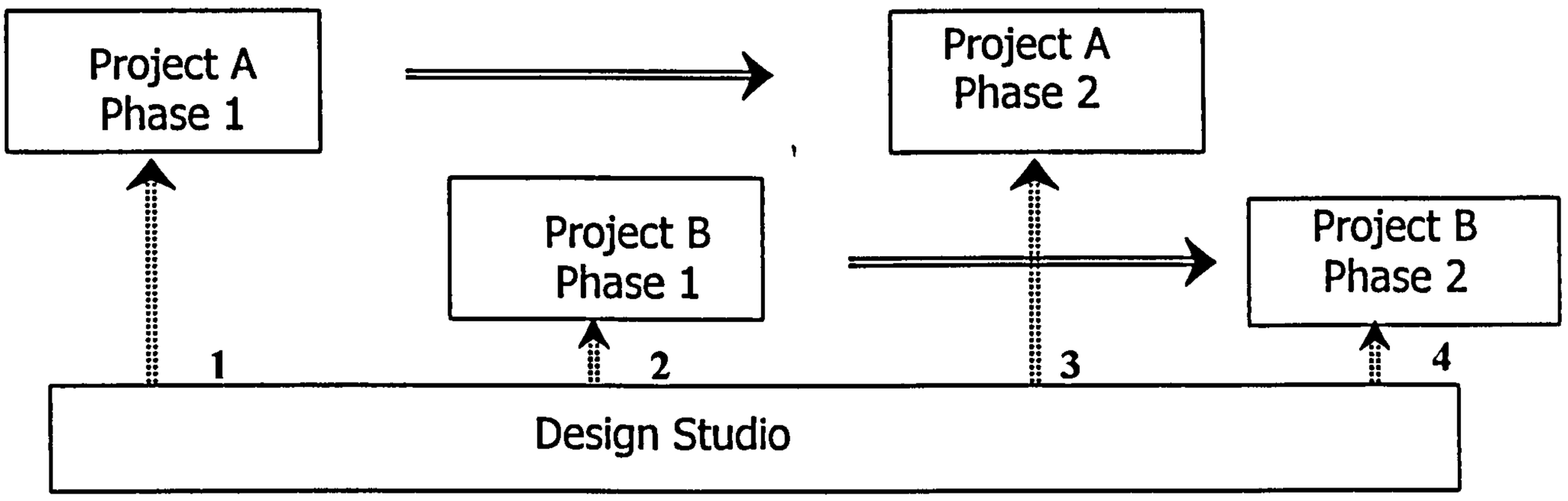


Figure-5: Architectural Learning Tool's Learning Model

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Paper Title: Design as narrative: developing student's design practice by improving design description

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Design as Narrative:

Developing Students Design practice by Improving Design Description

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Abstract

Deconstructing design action into different activities creates a framework for assessing students' design practice. This paper presents some findings of research which was conducted to develop a design learning tool which aims to allow students to present and discuss their design practice in the manner of narrative. The Reflective Practice Theory description of the design provides the research with a framework, which was adapted and modified to develop the required tool.

Keywords: design education, learning tool, reflective practice, deconstructing design activity.

Introduction

The Reflective Practice Theory, which was developed by D. Schon as a paradigm for describing design activities, considers design action as a conversation between designer and design situation. This description creates unique opportunities for researchers to understand this act, and implement it into different applications. The theory proposes a new design description, which deconstructs the design act into four activities, each one represent a specific moment in the design process (Schon 1983), (Valkenburg 2000). The design act is deconstructed, or broken down, into specific stages such as: naming, framing, moving, and reflecting. This creates a framework for teaching students how to present and discuss design in meaningful manner. The new tool that we called "Architectural Learning Tool" (ALT) aims to develop the students design skill through achieving the following objectives:

1-Improving students design practice;
2-Increasing students participation in design studio;

3-Exposing students to other designers' experience;

4-Increasing the students understanding of design's situation.

This paper will concentrate on the first objective through developing a design-learning tool that could allow students to present and discuss their design practice, and that of others, in the manner of narrative. The narrative act deconstructs the event into sequence of stages, and at the end the whole sequences of stages could draw a complete picture of the event. Therefore, students could perform their design presentations and discussions by deconstructing their design process into a sequence of events, starting with the naming stage, in which the students identify the main aspects in the design problem, and ending with the reflecting stage to evaluate their design decisions. This framework of presenting and discussing could enhance the discussion mode of others and direct their discussion and feedback toward these stages. ALT adapts Schon's description and develops it to formulate a communication means between student and others. This research aims to improve the student's design practice by improving:

-The designing act;

-The ability to discuss;

-The ability to present.

Therefore, the researcher aims to provide students with the required tool to asses and improve their design practice. To create the appropriate environment inside the deign studio, a new design-teaching model has been developed (Bakarman 2000). This consists of two parts:

1-Deconstructing the design process.

2-Replicating other student's design acts.

In this model, students conduct their design presentations and discussions by deconstructing the design process according to the four activities framework, and expose themselves to other designers' experience by replicating their design practice. The researcher had identified a significant improvement in students' awareness about different aspects in their design practice, and how they could carry out a meaningful design discussion.

Deconstructing Design Activities

The main reason for imposing such framework is to allow them to organise their design discussion and presentation around specific stages, which, at the end, could enhance the students design practice. The Reflective Practice Theory deconstructs the design act into four activities as follow:

1-Naming

At this stage, the designer names, or identifies, a number of characters that represent the main issues in the design problem. As Valkenburg argued (Valkenburg 2000): …the designer makes a choice for what he thinks matters in the design situation..

2-Framing

At this stage, the designer reverses, or twists, the character's need into architectural format. Frames, according to Valkenburg: "….are sense-making devices that establish the parameters of a problem".

3-Moving

At this stage, the designer conducts an experimental design action, or proposition, to test the frame(s). Valkenburg described this activity as "…the actual designing takes place. The designer experiments to solve the design problem. Activities, like generating ideas, exploring problems, or looking at the consequences of design decisions, undertaken by the team, are called moves."

4-Reflection

This is the last step in this sequence. Here, the designer evaluates and criticizes not only the last move(s), but also the framing act proceed it, which will determine the consequence step, either by constructing another move or by re-framing the design situation again. Schon, 1983 stated that ".. The designer evaluates his moves in a threefold way: in terms of the desirability of their consequences judged in categories drawn from the normative design domains, in terms of their conformity to or violation of implications set up by earlier moves, and in terms of his appreciation of the new problems or potentials they have created…"

These activities usually occur in sequences, but the cycle may not be completed in full because some moments of jump or overlap may occur, and in general, the four activities occur in most design activities (Valkenburg 2000). In some cases, the designer may introduce a new character and ignore it without sufficient assessment, which could be considered later as missed opportunity. Alternatively, the designer may conduct a new move when the best would have been to re-frame the design problem again. In addition to that, if the designer miss-interpreter a character's need, they could frame it incorrectly, which could effect the consequence move(s).

Design Experiment

The design experiment was designed to test the effectiveness of the ALT's framework and consisted mainly of three stages:

1-Designing Stage;

2-Replicating Stage;

3-Re-Designing Stage.

The three stages reflect the essence of the ALT. There are some aspects to be clarified before describing the experiment.

Subject Profile

The ALT as a learning tool, aims to provide students with new design method and mode. Therefore, determining the subjects and the appropriate stage to apply the ALT was studied in great details. Using the UK architectural educational system as a model, the appropriate stage was found to be the second year. The second year was appropriate for many reasons:

1- The natures of the second year as a mid-way point in the British architectural education system, where students acquire their basic skills.
2- The students, at this level, do not yet formulate their own design strategies and methods.
3- The students' design practice can easily accept new design models and techniques.

Studio Setting

Increasing student's participation in the design studio is considered as another objective of the research (Bakarman 2000). Therefore, the researcher tried to create a student-centred environment. Doidge, 2000 criticized the student-centred environment and reached the conclusion that: students view design crit as a key means for professional knowledge and experience. They valued it highly; the students were waiting to hear from the design tutors more than other colleagues. The design crit was, therefore, converted into a mixture with maximum student involvement and minimum tutor involvement.

The Project

The project was to design a small pavilion in a park. The building was The National Fairground Archive Interpretation Centre; it was intended to host a collection of material on fairgrounds, such as pictures, posters, and other archive materials. This type of project, as students stated at the final interview, was the perfect size for such an experiment.

The Time Frame

The students were given five weeks for this project and the aim behind such a short time was to allow students to develop a design concept only, without going deep into the details.

The Experiment Sequence

During the experiment, the whole sequences of the events was not given to the students in advance, instead each stage was introduced after the completion of the proceeding one.

The Experiment Stages

The Designing Stage

At this stage, the project was commenced as a normal design studio, and the researcher was aiming to allow students to utilize their own design method and mode without imposing any new model. The reason was to give the students the

freedom to practice design as usual, and only after that they could conduct comparisons and identify the differences between the two models. The design action started by discussing the design brief and a site visit was organised followed by a client's meeting, in addition to, visiting the Fairground archive at the University of Sheffield. During the first week, the students completed the design's conceptual phase and conducted several crit sessions at their workstation with the studio tutors. The end of the week a more formal design crit was conducted. This was formulated as a "student-led crit" (White 2000) to encourage students to be active and participate in the design discussion and presentation with minimum involvement of design tutors.

The Replication Stage

After the first formal design crit, the researcher introduces ALT and its framework emphasizing the role of the Precedents. After that, the students were each asked to explain their design process to a colleague using drawings, sketchbook(s), and model(s). At this stage, the students were asked to follow the new framework and deconstruct their design process according to that, and to identify the four stages if possible. The second step was to ask each student to replicate the design process of his or her colleague and to complete a replication report according to the four activities framework. At the meeting that followed, each student presented his/her replication report, which allowed other students to comment on and justify their ideas and intentions. It also allowed the two involving students to defend their ideas and clarify them if their thoughts had been misinterpreted or misunderstood.

Re-Designing Stage

At the end of the replication stage, each student was asked to re-design the project in a new site. This stage took around one week, and each student was asked to re-design the project in the manner of the other student (Bakarman 2000). The reason behind the change of the site was to encourage students to fully understand the other student's scheme, and extract the essence of designer's concept. Each student was allowed to communicate with the other student during the re-designing stage to clarify any aspects, but the new scheme had to reflect the essence of the first student's concept.

At the end of the third stage, the final design crit was conducted. Here, each student had to present the first and the second scheme, making comparisons in the following formats:

1- Comparison between the design mode of the same student in the two schemes.
2- Comparison between the design approaches of the same student at the two sites.
3- Comparison between the two students, and how each had one handled the same project at the two sites.

Evaluation Method

The researcher employed various means to get the students' feedback and capture their feeling using a questionnaire and interviews. All of the sessions were recorded and transcribed, and the students' drawings and sketches were studied and analysed. In addition to that, the questionnaire was distributed, after the final design crit, to get the students' immediate feedback. Interviews were carried out in two different formats: group and individual.

Experiment Results

ALT, as means for assessing the students design practice, creates the opportunities for students to asses their own design practice. From the data analysis, the researcher has identified a number of findings that fulfil some of the research objectives and aims.

These findings are as follow:

1- ALT, as learning tool, provides students with a means of communication between the designer and others.
2- The Precedent activity plays an important role during the design process. It is a source of inspiration providing design concepts and ideas.
3- ALT became as a means for improving and assessing design practice from number of different perspectives. These were:
    a- Identifying the strong and the weak side of each student's design practice;

b- Identifying missed opportunities and ignored design approaches;

c- Providing students with a way of viewing and assessing their design practice from different perspective.

The present paper will discuss the last category and leave the other categories to be discussed in future publications.

ALT as means for improving and assessing design practice

The findings of the experiment may be categorize as follow:

a- Identify the strong and the weak sides of each students' design practice

In the students' interviews and the questionnaires, they were asked to consider ALT as means of assessment for their design practice (Figure- 1). The deconstructing activities highlight the main stages of the design process, and guide the students to evaluate each stage in isolation from other stages in order to identify the strong and the weak sides. The replication activities allow students to encounter and understand the design process of others and clarify some weak points in their practice (Figure- 3). The re-designing process exposes the students to others' design practice, which at the end allow them to identify the main reason behind different design decisions and evaluate their design practice (Figure-2). In addition to that, the new design setting improves the quality of the students' participation by allowing comparison with the existing design setting, (Figure- 4).

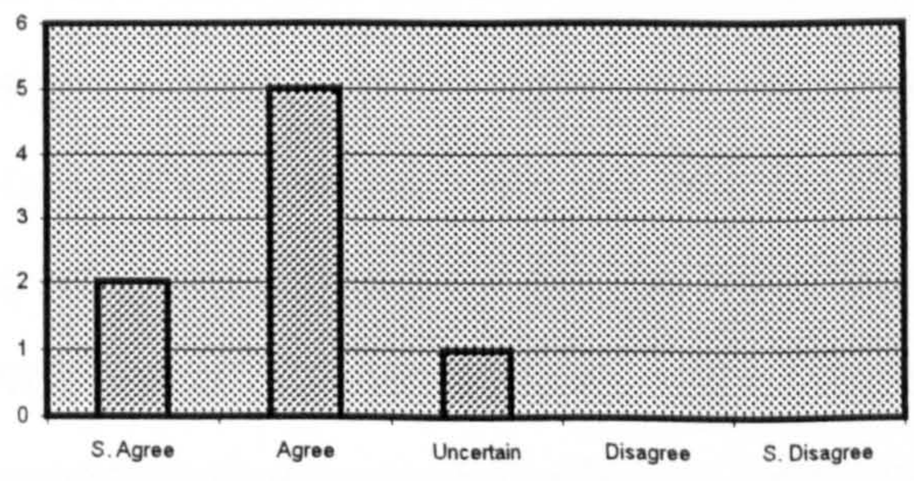

Figure- 1 **ALT provides students with means to asses their design practice**

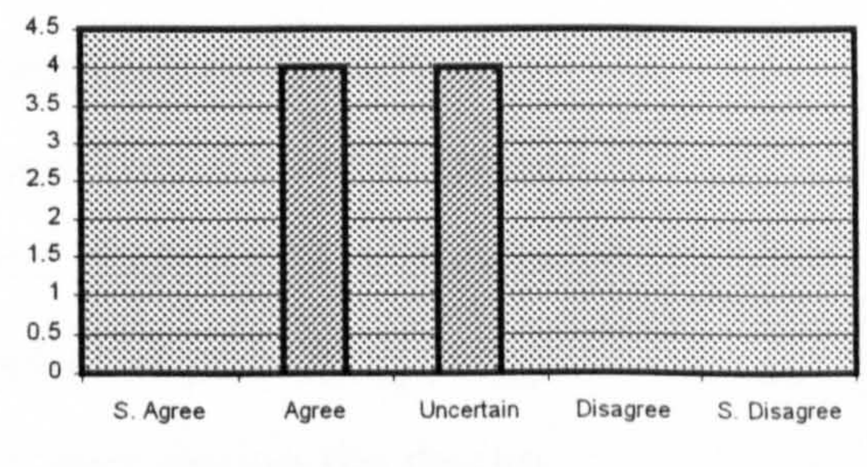

Figure- 2 **ALT provides students with means to asses others design practice**

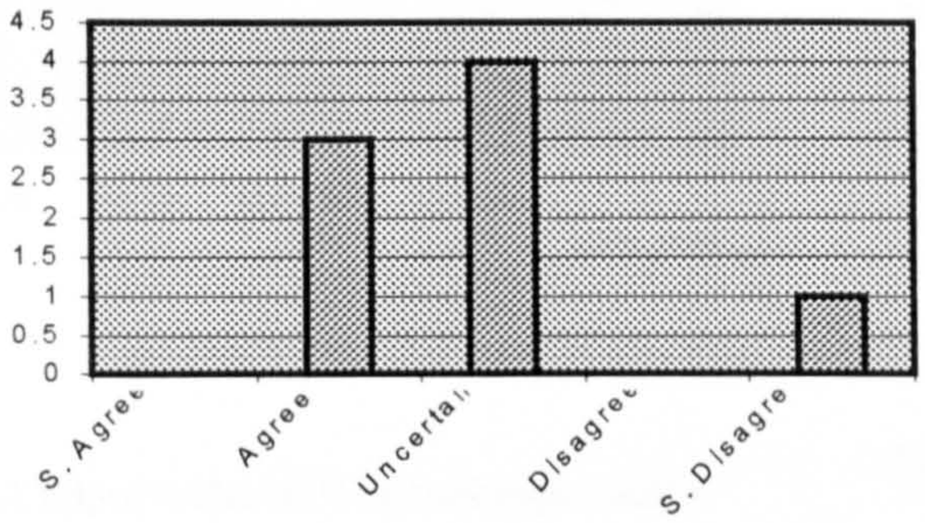

Figure-4 **ALT helps to identify Significant differences between the new design mode and the existing one.**

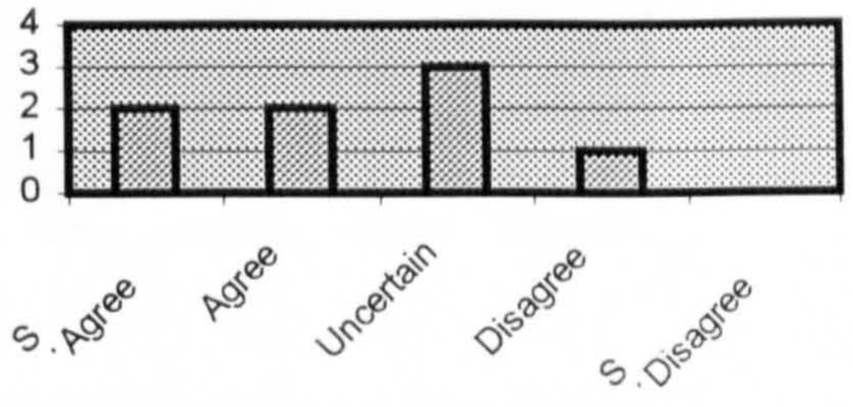

Figure-3 **ALT provides a way to identify the strong and the weak sides of others design practice**

b- Identify missed opportunities and ignored design approaches

Deconstructing, replicating, and re-designing activities provide students with good opportunities to look again at their design practice and identify many missed opportunities and some ignored design approaches. While students are involved in the design action they may be distracted from the most important things, as Cotton argued:

> *If you are in the middle of things, your attention cannot be focused all the time on what is best for learning; you tend to get involved, so that selective attention starts to work and you may miss some essential point of experience. When you have the chance to see the events again you have a much better chance to balance and select from learning.* (Cotton 1995)

The ALT activities allowed students to be reflective and re-consider many design decisions. At the replication stage, students were able to identify many good concepts, which were not well developed and were considered as missed opportunities (Figure- 5). On the other hand, when the students track the design development of other students, some identified a number of promising design approaches that were discarded or ignored by the designer during the design action (Figure- 6).

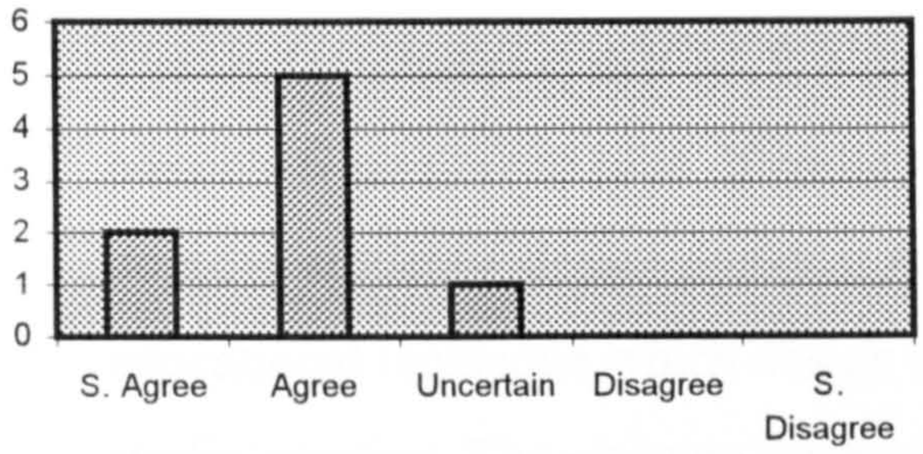

Figure-5 **ALT helped to identify the missed opportunities**

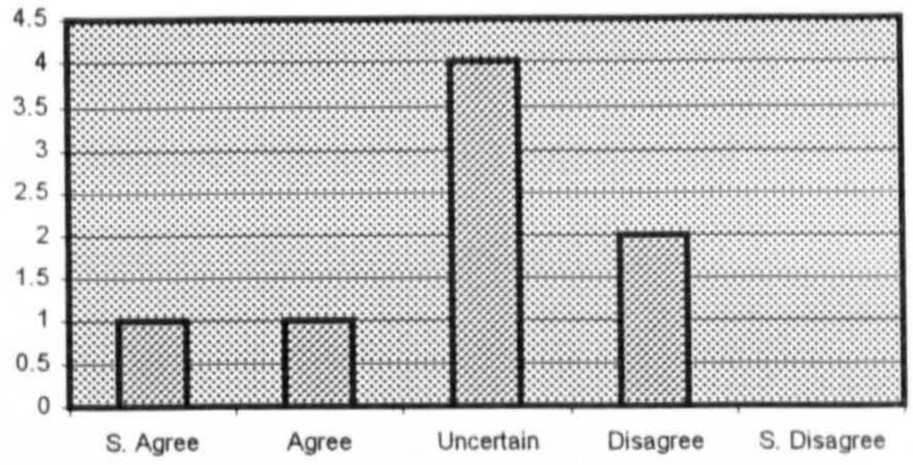

Figure-6 **ALT helped to identify ignored design approach**

c- Providing students with a way of viewing and assessing their design practice from different perspective:

Listening to the replication report, and watching the result of the re-designing action allowed most students to view their design practice from different perspectives, and to be more sensitive toward their design practice and making considerable revising to some of their design strategies (Figure- 7). The replication activities not only benefited the replicator but also the first designer. The first designer had the chance to examine the replication report and see how others viewed his/her design practice.

From the questionnaires and the interviews, we can see that the majority of the students were aware of the opportunities that the ALT provided for them; they valued the chance to view their design practice from different perspectives.

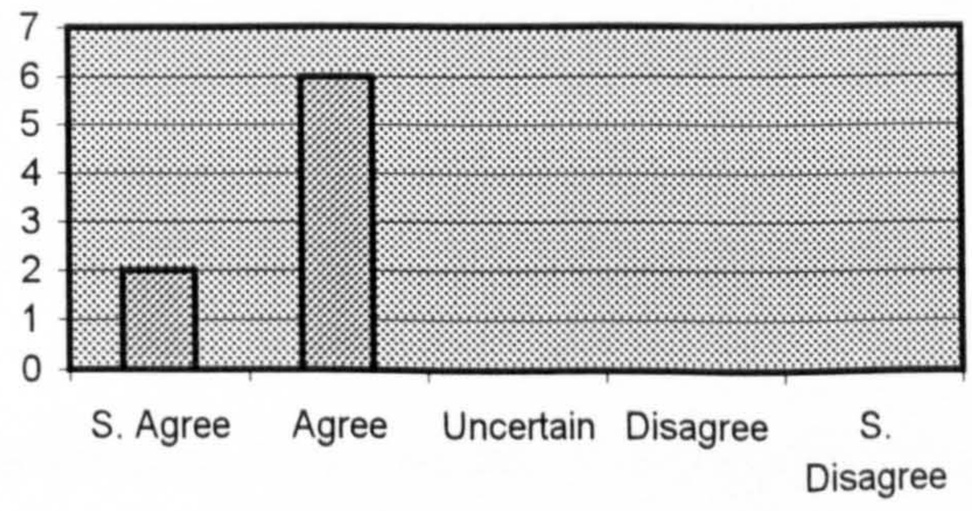

Figure-7 **ALT helped students to look at their design practice from different perspectives**

Further Works:

The students believe, that ALT is certainly useful as a "one-off" experience, or possibly from time to time. It could, therefore, be seen as an assessment tool to improve students' design practice. ALT may need to be converted into an educational technique which design tutors could utilize as required in the design studio practice. The ultimate format for the ALT could be as a technique, which can be used by students whenever they need to asses and criticize their design practice. To achieve this, farther studies and development work will be required.

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DESIGNING TOOL

Developing Students Design Practice by Improving their Design Communications

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The Reflective Practice Theory provides researchers with a framework for describing design action. For the current research, this description has been adapted and modified to develop the research tool. The research tool aims to develop students' design practice by providing a communication means that could improve their design presentation and discussion. This communication means deconstructs the design action into four activities, in which each one represent specific moment in the design. This deconstructing framework, which was developed by D., Schon, was adapted and modified to formulate the required means. From the research experiment's findings, the communication means allows students to present their works in meaningful manner, and, in other hand, allows other students to join the discussion and become active in their participation and provide the presenter with valuable feedback.

Introduction

The Reflective Practice Theory, which was developed by D. Schon as a paradigm for describing design activities, considers design action as a conversation between designer and design situation. The theory proposes a new design description, which deconstructs the design act into four activities naming, framing, moving, and reflecting, and each one represent a specific moment in the design process (Schon 1983), (Valkenburg 2000). This description creates unique opportunities for researchers to study this act, and implement it into different applications. For this research, this description is utilized to create a communication means between designer and others, which could allow the designer to present and discuss his/her work in meaningful manner and allow the listeners to track the idea's development from the generation stage till the final one. In addition to that, it creates a framework for teaching students how to present and discuss design in more realistic manner. The research tool that we called "Architectural Learning Tool" (ALT) aims to develop the students design skill through achieving the following objectives:

1-Improving students design practice;

2-Increasing students participation in design studio;

3-Exposing students to other designers' experience;

4-Increasing the students understanding of design's situation.

This paper presents the research findings of developing a communication. Students could perform their design presentations and discussions by deconstructing their design process into a sequence of events, starting with the naming stage, in which the students identify the main aspects in the design problem, and ending with the reflecting stage to evaluate their design decisions. This framework of presenting and discussing could enhance the discussion mode of others and direct their discussion and feedback toward these stages.

The first research objective, which is the aim of this paper, could be accomplished through improving:

- How student conducts design;
- How student presents his/her design works;
- How student discusses other student works.

The ALT requires some modifications in the existing design studio setting, therefore, a new design-teaching model has been developed (Bakarman 2000). In the design experiment, students conducted their design presentations and discussions by imposing such framework in the design practice. The researcher

had identified a significant improvement on students' abilities to carry out a meaningful design discussion, and presentation after utilizing the new tool. Partial of these findings has been reported in other paper (Bakarman 2001).

Deconstructing Design Activities

The main reason for imposing such framework is to allow students to organise their design discussion and presentation around specific stages, and creates a base for discussion, which at the end could enhance the students design practice. The Reflective Practice Theory deconstructs the design act into four activities as follow: (Bakarman 2001)

1-Naming

At this stage, the designer names, or identifies, a number of characters that represent the main issues in the design problem. As Valkenburg argued (Valkenburg 2000): "...the designer makes a choice for what he thinks matters in the design situation."

2-Framing

At this stage, the designer reverses, or twists, the character's need into architectural format. Frames, according to Valkenburg: "....are sense-making devices that establish the parameters of a problem".

3-Moving

At this stage, the designer conducts an experimental design action, or proposition, to test the frame(s). Valkenburg described this activity as "...the actual designing takes place. The designer experiments to solve the design problem. Activities, like generating ideas, exploring problems, or looking at the consequences of design decisions, undertaken by the team, are called moves."

4-Reflection

This is the last step in this sequence. Here, the designer evaluates and criticizes not only the last move(s), but also the framing act that proceed it, which will determine the consequence step, either by constructing another move or by re-framing the design situation again. Schon, 1983 stated that ".. The designer evaluates his moves in a threefold way: in terms of the desirability of their consequences judged in categories drawn from the normative design domains, in terms of their conformity to or violation of implications set up by earlier moves, and in terms of his appreciation of the new problems or potentials they have created..."

Design Experiment

The design experiment consists mainly of three stages, which reflect the essence of the ALT:

1-Designing Stage;

2-Replicating Stage;

3-Re-Designing Stage.

There are some aspects that have to be clarified before describing the experiment.

Subject Profile

ALT as a learning tool, aims to provide students with new design method and mode. Therefore, determining the subjects and the appropriate stage to apply the ALT was studied in great details. Using the UK architectural educational system as a model, the appropriate stage was found to be the second year for the following reasons:

- The natures of the second year as a mid-way point in the British architectural education system, where students acquire their basic skills.
- The students, at this level, do not yet formulate their own design strategies and methods.
- The students' design practice can easily accept new design models and techniques.

Studio Setting

Increasing student's participation in the design studio is considered as another objective of the research (Bakarman 2000). Therefore, the researcher tried to create a student-centred environment, and modify the existing studio setting to create the required environment. Doidge, 2000 criticized the student-centred environment and reached the conclusion that: students view design crit as a key means for professional knowledge and experience. They valued it highly; the students were waiting to hear from the design tutors more than other colleagues. The design crit was, therefore, converted into a mixture with maximum student involvement and minimum tutor involvement.

The Project

The project was to design a small pavilion in a park. The building was The National Fairground Archive Interpretation Centre; it was intended to host a

collection of material on fairgrounds, such as pictures, posters, and other archive materials.

The Time Frame

The students were given five weeks for this project, and the aim behind such a short time was to allow students to develop a design concept only, without going deep into the details.

The Experiment Sequence

During the experiment, the whole sequences of the events was not given to the students in advance, instead each stage was introduced after the completion of the proceeding one.

The Experiment Stages

The Designing Stage

At this stage, the project was commenced as a normal design studio, and the researcher was aiming to allow students to utilize their own design method and mode of communication without imposing any new one. The design action started by discussing the design brief and a site visit was organised followed by a client's meeting, in addition to, visiting the Fairground archive at the University of Sheffield. During the first week, the students completed the design's conceptual phase and conducted several crit sessions at their workstation with the studio tutors. At end of the week, a more formal design crit was conducted, this was formulated as a "student-led crit" (White 2000) to encourage students to be active and participate in the design discussion and presentation with minimum involvement of design tutors.

The Replication Stage

After the first formal design crit, the researcher introduces ALT and its framework emphasizing the new communication means and how students could utilized it. After that, each student was asked to explicit his/her design process to a colleague using drawings, sketchbook(s), and model(s). At this stage, the students were asked to follow the new framework and deconstruct their design process according to that, and to identify the four stages if possible. The second step was to ask each student to replicate the design process of his or her colleague and to complete a replication report according to the four activities framework. At the meeting that followed, each student presented his/her replication report, which allowed other students to comment on and justify their ideas and intentions. It also allowed the two involving students to defend their

ideas and clarify them if their thoughts had been misinterpreted or misunderstood.

Re-Designing Stage

At the end of the replication stage, each student was asked to re-design the project in a new site. This stage took around one week, and each student was asked to re-design the project in the manner of the other student (Bakarman 2000). The reason behind the change of the site was to encourage students to fully understand the other student's scheme, and extract the essence of designer's concept. Each student was allowed to communicate with the other student during the re-designing stage to clarify any aspects, but the new scheme had to reflect the essence of the first student's concept.

Evaluation Method

The researcher employed various means to get the students' feedback and capture their feeling using a questionnaire and interviews. All of the sessions were recorded and transcribed, and the students' drawings and sketches were studied and analysed. The questionnaire was distributed, after the final design crit, to get the students' immediate feedback, and the interviews were carried out in two different formats: group and individual.

Experiment Results

ALT, as means for developing the students design practice, creates the opportunities for students to improve their design discussion and presentation. From the data analysis, the researcher has identified a number of findings that fulfil some of the research objectives and aims. These findings can be categorize as follow: (Bakarman 2001)

- ALT, as learning tool, provides students with a means of communication between the designer and others.
- ALT became as a means for assessing design practice.
- The Precedent plays an important role during the design process. As it act as a source of inspiration providing design concepts and ideas.

The present paper will discuss the first category and the second one was discussed before, (Bakarman 200). The last one will be discussed in future publications.

The communication tool improve student's presentation and discussion into two field:

A. How student presents his/her work:

Under this category, the experiment investigates two aspects, which were believed to be the most important one:

1. ALT allows students to be explicit in their design process:

The design process as cognitive activities refuses to be explicit and explained by direct speech. The new tool helps some students to cure this dilemma by providing them with vocabularies to explicit their design process in meaningful manner and build the base for communication which could increase the students understanding of the design practice and direct their conversation toward the process more than the product. (Figure- 1)

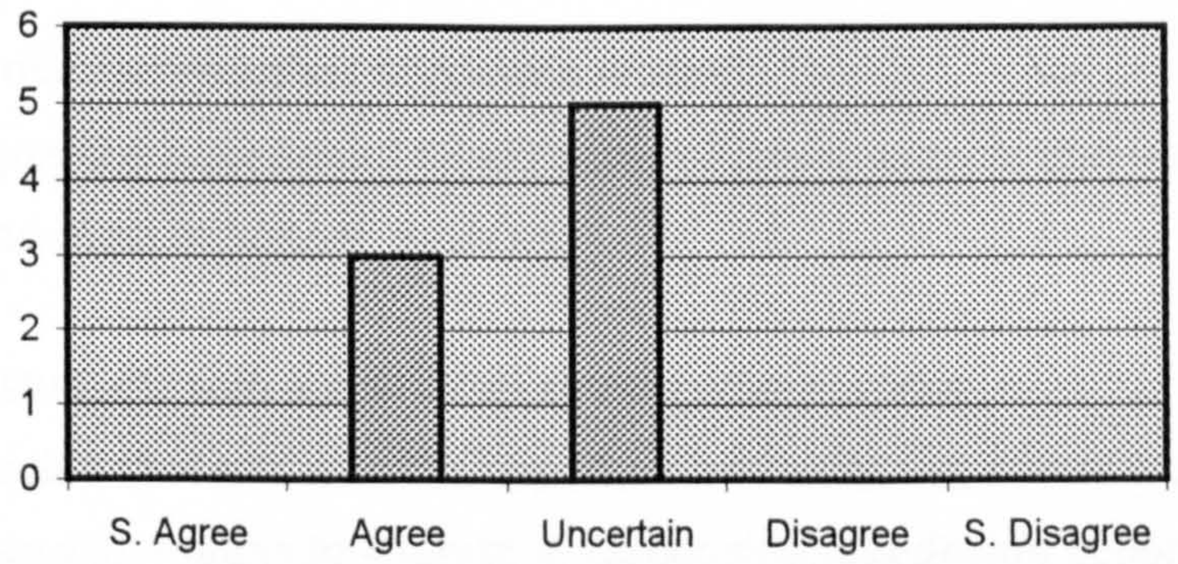

Fig. 1: ALT allows students to explicit their design process

2. ALT creates the base to encourage other students' feedback:

While students discuss and present their works they would like the listeners to concentrate on the process more than the end product, beside encouraging them to be more unconditional in their feedback. Therefore, ALT try to impose a framework on the design presentation and discussion, this framework not only organize these activities, but also direct them toward preferred stages and moments in the design process. From the design experiment, the student who follows the provided framework conducted a more organized presentation and discussion, and helped other students in directing their discussions and feedback toward the preferable one. In other hand, other students feedback become more useful and meaningful because they concentrated on specific issues which at the end help other students to benefit the most from their design crit and at the end could improve their design practice. (Figure- 2)

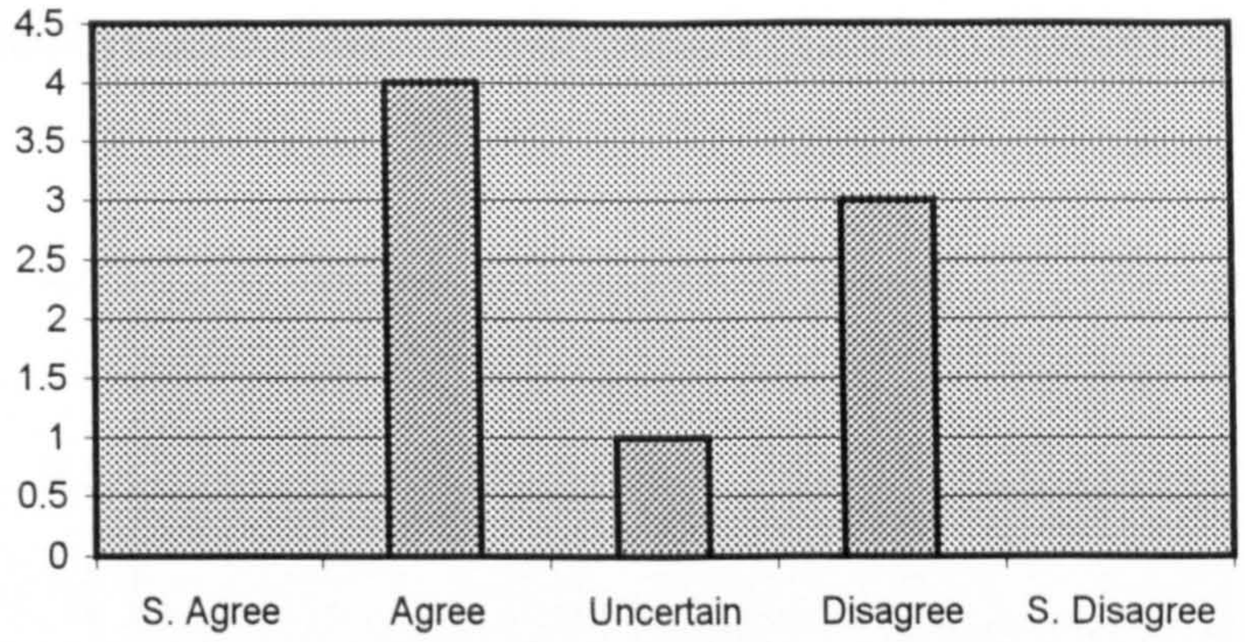

Fig. 2: ALT creates the base to encourage others students feedback

B. How student discusses other student's works:

Under this category the experiment investigates different aspects that were believed to be the most important, such as:

1. *ALT provides students with a skill for analysing others works:*

ALT not only provide students with the opportunities to discuss others works but also provide them with means to analyse it. Deconstructing design action into the four activities allows students to analyses other students work in order to discuss and re-present it. This analytical skill was utilize during the replication activity, in which each student try to extract the essence of other student work in order to re-design the same project at the same manner. (Figure- 3)

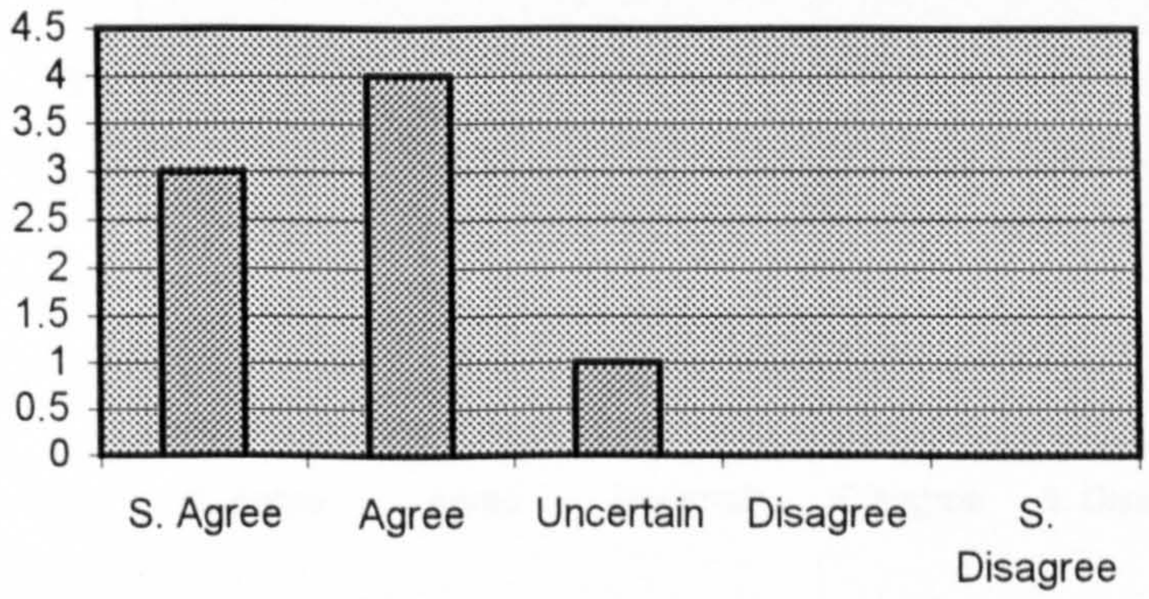

Fig. 3: ALT provides students with a skill for analysing others works

2. *ALT allows students to identify the reason behind many design decisions:*

To discuss and re-present other students design work you have to extract the reason behind each design decision. The replication activity create a unique opportunities to identify such aspect. Each students, during the design

experiment, was asked to re- present and re-design other student works, therefore identifying the reason of many design decisions became necessary. (Figure- 4)

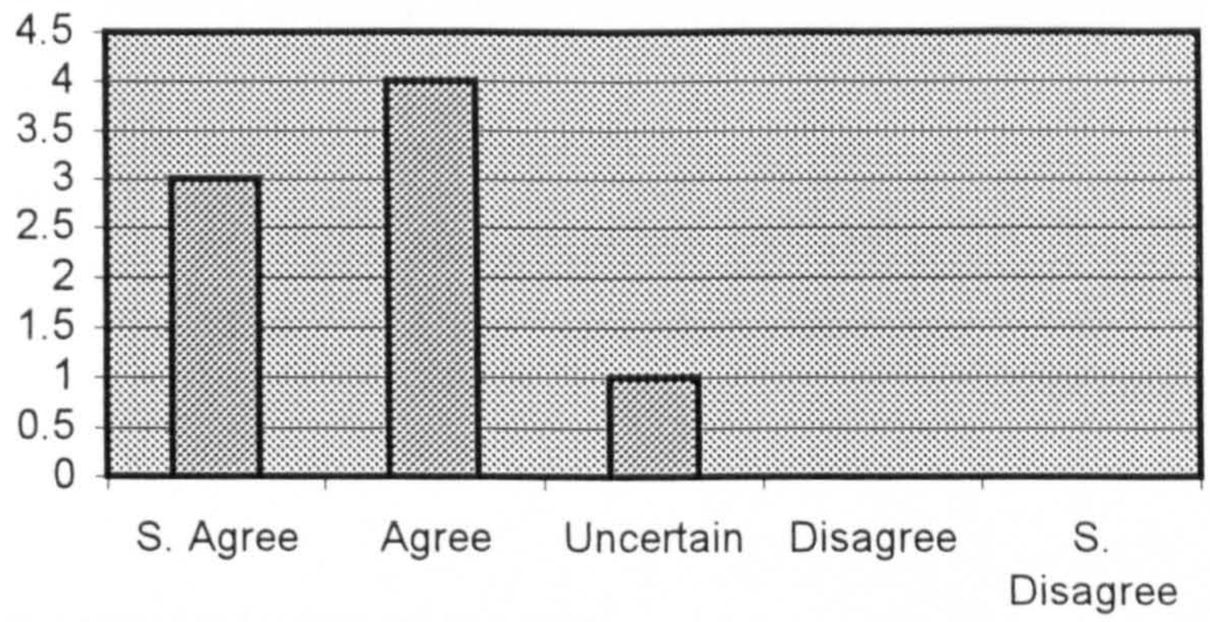

Fig. 4: ALT allows students to identify the reason behind many design decisions

3. *ALT allows students to draw the map of other's design process:*

To establish a meaningful discussion, the students could try to draw the map of others designs process in order to direct their discussion. To draw such mental image, student has to identify and highlight the components of the required map in order to compose it. Deconstructing the design action into the four activities offers such components. The design experiment findings indicate a significant improvement in student abilities to draw the design process's map. (Figure- 5)

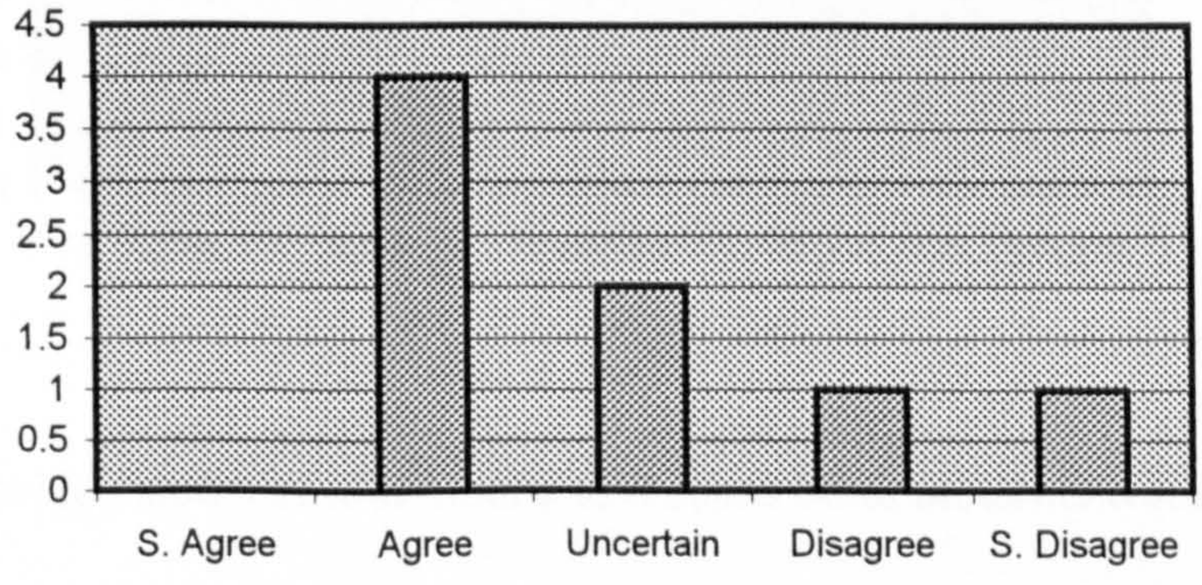

Fig. 5: ALT allows students to draw the map of other's design process

In addition to that, the students were asked to clarify if they were able to construct the line of thoughts of other students, and their respond indicate good degree of improvement, (Figure-6).

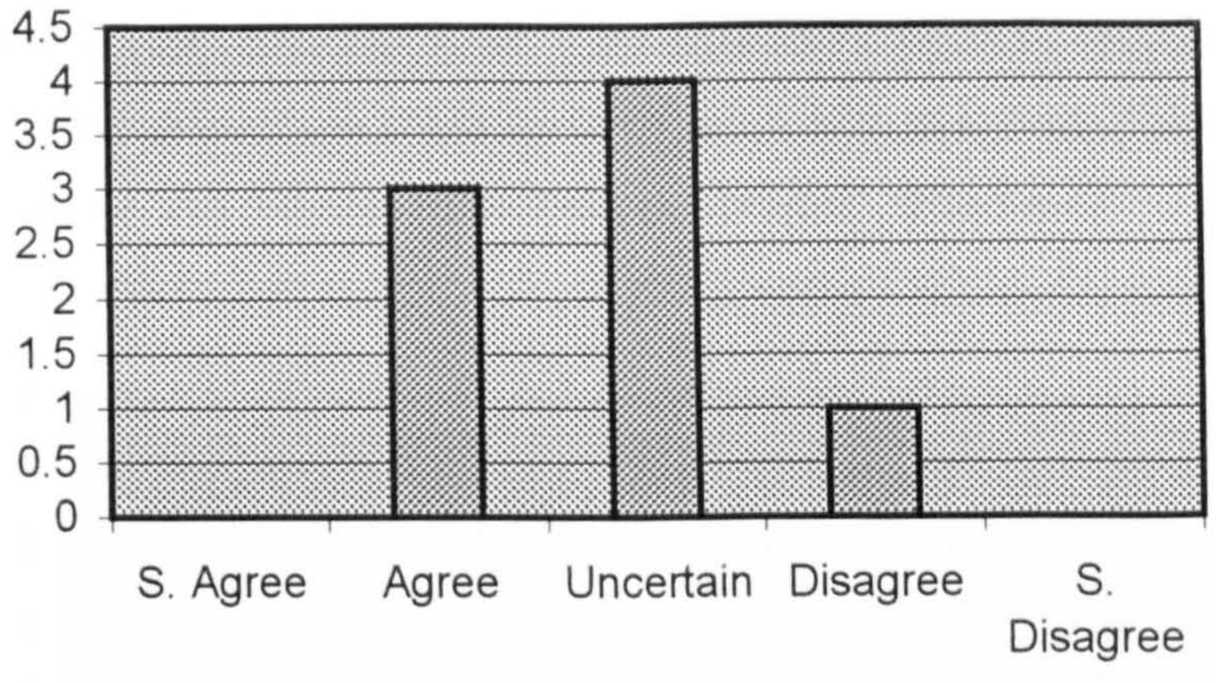

Fig. 6: Draw other students' line of thoughts

4. *ALT provides students with means to discuss other students works:*

The new tool allows students to build a base for communication and discussion among themselves, in which the discussion could be enrich if the participants understand each other. From the design experiment, the students agreed that the new tool allow them to discuss others works in meaningful way and direct the discussions toward preferable issues. (Figure- 7).

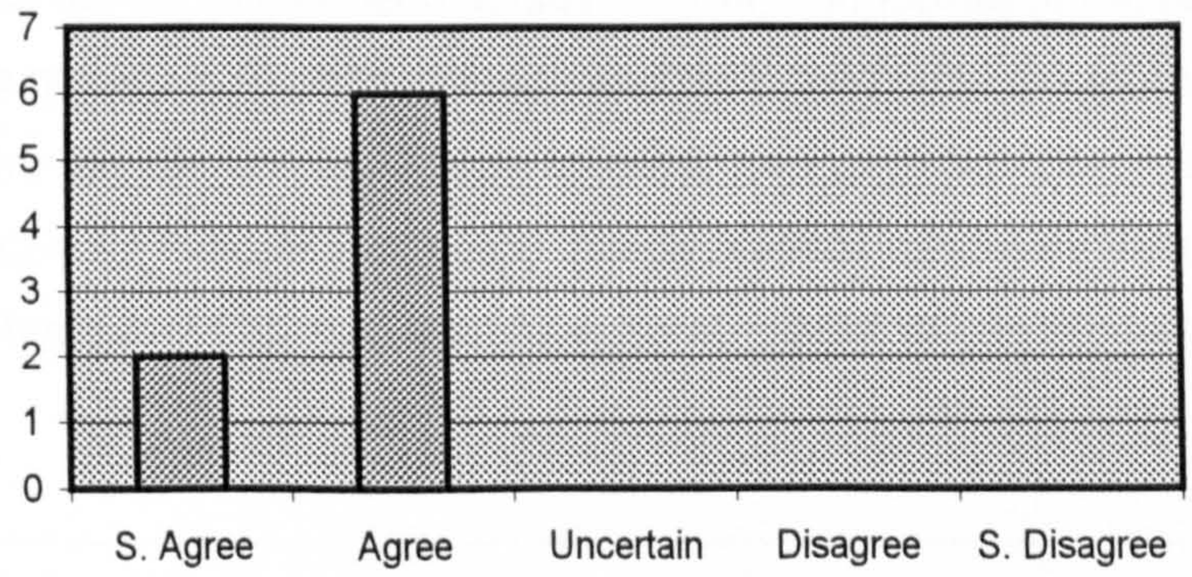

Fig. 7: ALT provides students with means to discuss other students works

5. *ALT allows students to acquire the abilities to re-present others works:*

To re-present others works you have to fulfil two tings:

- Understand the designer's design mode and strategies;
- Acquire the means of presentation.

The ALT was aiming to allow students to acquire such tool by encouraging them to replicate other students' works and re-design it. The replication process, as mention before, could be accomplished after understandings deign process and

how the designer conducts such action. In addition, try to present it as it occur, and identify the strong and weak side of the designer's practice, (Bakarman 2001). This means encourage students to be more critical in their presentation and concentrate on the process more than the product, (Figure-8).

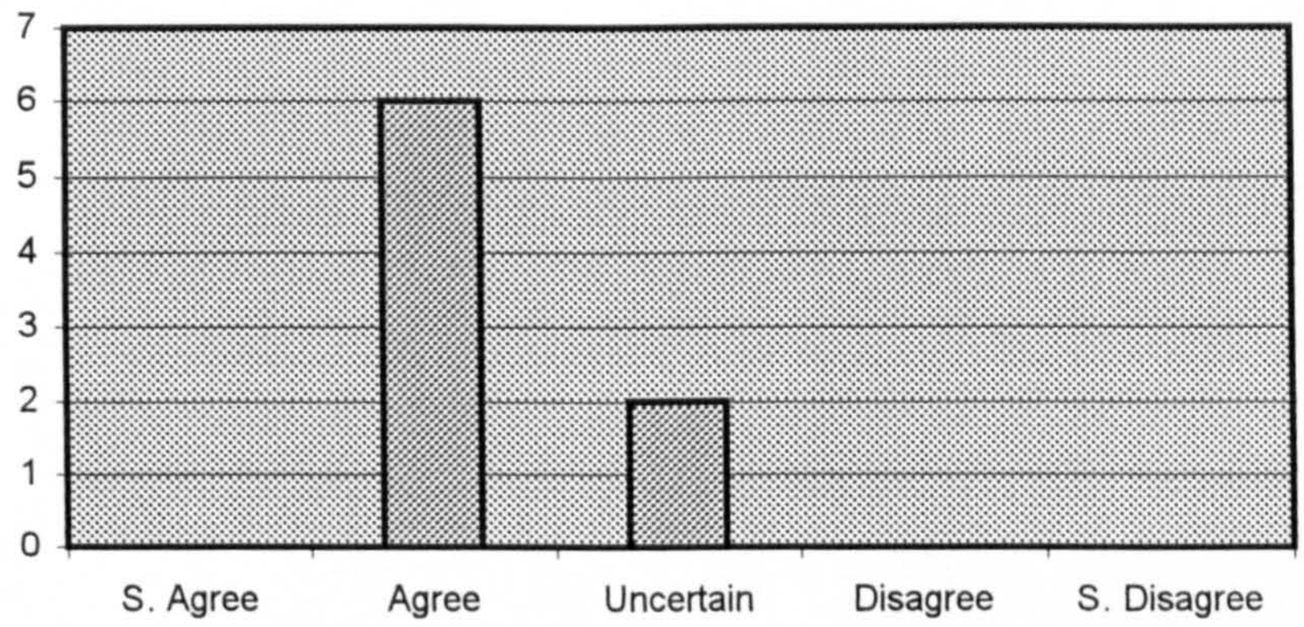

Fig. 8: ALT allows students to acquire the abilities to re-present others work

Conclusion and Further work:

From the presented findings, which reflect the effeteness of the new means in improving the students' kills for discussion and presentation, we can confirm that some research objective has been achieved. The final format of the research tool has to be modified. According to the students' feedback, the tool's format has to be more flexible and applicable for other type of design practice. The students' feedbacks indicate that some design practice cannot be deconstructed according to the current format, therefore, some modifications are needed.

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