The Role of Education in Achieving Local Identity- Based Interior Design by Utilizing Cultural Schema

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Abstract

Design education is the most important and crucial stage in a designer's preparation. The design studio is also the starting point in the process of teaching design students how to deal with the issue of identity. The paper discusses the major academic objectives and methodologies that were employed to explore the potential of cultural and architectural heritage as a valid platform for design education. The paper explores cultural schema through cognitive aspects by applying an empirical study and identifying the opportunities and constraints. The wider goal is to expand the boundaries of interior design, highlighting the role of interior design education in preserving our diversified traditional culture and the continuity of the local identity through achieving an innovational design. Under the monitoring to the final year interior design students, the empirical study was part of the design studio course. The effects of integrate elements extracted or derived from local identity into modern designs in their graduation project process through cultural schema theory are examined. As a result, a conceptual framework for discussing educating towards local identity is created, model that highlights the gaining of clear knowledge of design. The framework describes how students interpret the cultural meaning through interior design by adapting cultural schema theory. This was achieved by the following methodology; literature review in three main topics (cognitive, cultural schema that is forced to change or accommodate new information and design education) was applied. Moreover, this paper follows an empirical study methodology with an in-depth analysis of the data.

1. Introduction

Globalisation has created a new consciousness of local culture in an effort to sustain cultural values and identity. Given the need to highlight one's identity, which involves local identity and its relation to culture. The trend of cultural design is evident in the localisation and globalisation movements. Localisation goal is to create a design for the culture it emerges from, while globalisation aims to produce a cultural design for the international market (Hsu, C.H., Chang, S.H., 2013).

Interior Design education is the most important and critical stage in setting up the interior designer. Also, the design studio is considered the point of departure in the process of teaching interior design students how to deal with the issue of design identity. According to Tarek Abdelsalam (2009), because some of globalization young designers are influenced and affected

by western thoughts; therefore, the educational process is exposed to the western design reflection. This thought affects the process directly through the dominant western interior design publications, indirectly through the accumulated thought of the academics who have studied and trained in the west, or through Internet that has found its way into reshaping students' minds as it brings new ideas that decrease their cultural sensitivity and eliminates cultural differences, creating a crisis of identity and local culture preservation (Dalia & Zeinab, 2018).

Accordingly, the Arab interior design thought will continue to be correlated to the contents and theories of the western thought until a new ideology replaces the existing one. The new ideology needs to address the identity dilemma in the design thought, which reflects a conflict between the authentic and the occidental, and the local and the global.

Setting up the interior design thought through the educational process is subjected to many educational and socio-cultural principles. As the educational process is based on a curriculum, this curriculum needs to focus on dealing with the issue of identity in a different way that overtakes the superficial level of cultural and historical artefacts. At this point, a critical question is raised, which is; what type of knowledge should be provided? and what is the appropriate strategy to be used to provide such knowledge? and how it could be applied in the design process? It is significant also to indicate that the research is based on schema theory that explains culture at the cognitive level and especially cultural schema theory, however, cultural schema and the spatial dimension of culture and its application in the interior design process have not been studied yet as most the studies focusing on product design.

2. Literature review

2.1. Schema theory

Schema is defined as cultural constructs in memory (Bartlett, 1995), it is a sort of mental state deep-seated in our conscience, organized mentally as a framework of our past experiences, images, behaviour, environment or events. This input structure represents the generic concepts stored in memory. Schemas are higher-order cognitive structures that have been considered to motivate many aspects of human knowledge and skill. Schema theoretic notions became the active power of stimulation, a head of empirical investigation methods within processes, as a conceptual (visionary) structure, which represents our knowledge of objects, situations, events, actions and sequences of action (Anderson & Pearson,1984; Brewer& Nakamura,1984; Campbell,1989; D'Andrade, 1992; Rumelhart & Ortney,1977; Wertsch, 1991).

Schema stores perceptual and conceptual information about the world and makes interpretations of events (Uysal, 2012). Furthermore, the schema is hierarchically prepared to store information in different levels from abstract to concrete. Both concrete ones (e.g., visual appearance, written law) and abstract (e.g., faith, justice) are stored and can be applied (Rumelhart, 1984).

(Piaget)* stated that "human development existed as a process where the individual integrated between new experience and his present schemas" (Piaget, 1952). (Piaget) describes the growth of schemas in three steps; Assimilation (fully understanding- absorption), where an individual uses his existent (generic) schemes to make sense of a new event. This process includes trying to understand something new by adjusting it to what he already knows. Step two is accommodation, which is the alteration of existing

* Jean Piaget (1896 –1980) was a Swiss psychologist known for his work on education development and epistemological view are together called "genetic epistemology".

schemas to respond to a new state. While step three is Equilibration (to be balanced equally) which is the complicated act of compromising in organizing, assimilating, and accommodating. It is the state that encourages us to explore a solution throughout assimilation or accommodation (Piaget, 1952). The consequence of the aforementioned three steps is prior knowledge, surroundings of reference in understanding/interpretation of received information and in generating new ones (Bruning, Schraw & Norby, 2011). Moreover, (Brewer)* reformulated the (Piaget) process as schema-based information processing involving three elements:

− Generic schema, contains established structural knowledge, skills, relations, behaviour, etc. and slots to accommodate new information.

− Episodic input, information collected from the environment during the exposure to motivations.

− Instantiated schema, the consequence of the interaction between generic schema and episodic input. Instantiated schema, schema that is iterated and kept in the long-term memory. (Brewer and Nakamura, 1984)

2.2.Image schema and metaphor

An image schema is a repeated frequently format within cognitive processes which establish patterns of understanding and also it is a repeated dynamic pattern of our perceptual communication that gives logic structure to our prior knowledge, in addition, prior knowledge in a wide scope includes basic perceptual and cultural background, ideology, emotional, historical, social and language dimensions (Johnson, 1987). Therefore, cognitive individuals of ancient civilization lands based on certain identity, culture and ideology give priority to some of the image schemas differently. This view is based on dynamic embodied patterns which motivate conceptual metaphor mappings (Lakoff& Johnson, 1980). A metaphor is defined as "a cross-domain mapping in the conceptual system" (Lakoff, 1993). It shapes not just our communication, but also the way we think and act, and helps in mapping one idea and links it to another to better understand (Lakoff& Johnson, 1980). A metaphor acts creatively or is a creative   act   which   holds meaning on top of the schematic structures established by new connections that open the way of understanding novel abstract existence. To rephrase, metaphors are understood by accessing stored abstractions and taking it one step further (Metaphors are used frequently to understand theories, models, and help in the establishment of further comparisons (Lakoff& Johnson, 1980).

2.3.Cultural schema as a cognitive attribute

The anthropological researchers usually used the term cultural schema in their studies, such as those that explore the meaning of the cultural groups, and linguistic researches. The cognitive anthropologist (Roy D' Andrade) **conducted the best-known studies on cultural schemas; he initiated the concept of cultural schemas as types of basic schemas that form the meaning system of a cultural group. According to (D'Andrade) "schemas could concern individuals, objects, situations, events, and sequences of events and explained a cultural schema as an abstract

cognitive model that contains specific scripts with recognizable individual roles" (Nisbett & Norenzayan, 2017).

Many anthropological, sociological and psychological studies have discussed cultural schema in design research and have investigated the relationship between creativity and cultural schema. One of the most significant studies that has been published on these subjects was by (Mihaly Csikszentmihalyi) ***. He stated that "creativity is the cultural counterpart of genetic changes that result from biological evolution" (Csikszentmihalyi,1996). Csikszentmihalyi defined creativity as a mental process that cannot be separated from the social& cultural systems in which the individual live (Csikszentmihalyi,1999). He has also asserted that creativity is generated from interaction among three factors: culture; which keeps and transmits the chosen values, ideas, and beliefs to following generations, social system, which pick out information, values and behaviours that are worth continuing.

* William F. Brewer, Emeritus Professor of Psychology, cognitive psychologist at University of Illinois Urbana-Champaign.

**one of the founders of cognitive anthropology, was recognized in many ways for his contributions to anthropology and to cognitive science, In 2002, he was awarded the NAS Award for Scientific Reviewing from the National Academy, and in 2005 he received the Lifetime Achievement Award from the Society for Psychological Anthropology.

***Mihaly Csikszentmihalyi is a Hungarian-American psychologist. He recognised and named the psychological concept of flow, a highly focused mental state conducive to productivity. He is the Distinguished Professor of Psychology and Management at Claremont Graduate University

Nevertheless, Razzaghi (2009) asserted that, throughout the early stages of concept generation in the design process, demonstrations of culture subconsciously or unconsciously surface, to some extent as a result of the designer's cultural beliefs, values and preferences. Moreover, a Csikszentmihalyi (1999) stated that "creativity is a mental process that cannot be isolated from the socio-cultural systems in which

the individual functions". Obviously, culture and design process have a direct relationship to the cognitive process. As Sharifian (2001) indicated, "Cultural schemas are conceptual structures that enable an individual to store perceptual and conceptual information about his or her culture and interpret cultural experiences and expressions".

Also, Engeström (2001) indicated that the origin of creativity is not placed inside an individual's head, but it is a result of the interaction between individual thoughts and his socio-cultural environment. Culture has an impact on our thoughts, actions and the way we classify people into social categories based on their cultural traits (Gautam & Blessing, 2007).

In design, cultural factors allow better use of culture as a source of innovation. Also, they help to adopt technologies to suit their social context. One could argue that paying attention to cultural factors might affect the diversity of design concepts, and this enhances innovation. Such design innovation will have been assimilated within the person's socio-cultural context, and this might increase the user's satisfaction.

2.4.Spatial dimension of culture

Culture is the aggregate of mental depictions, their public expression, and subsequent behaviours in particular contexts. Those factors are continuously in non-stop interaction with each other. Culture involves mental, behavioural and physical states, which has been described by (Intan, Haruo& Shinichi, 2016) in terms of three levels of spatial dimensions of culture: the inner level which includes beliefs, values, preferences and other psychological aspects; however, intermediate level involves activities and behaviours.

 (Intan) also stated that one's behaviour is the reflection of norms, values, and beliefs, that are internalised at the inner level. The third level is the outer level that consists of artefacts, objects, design elements and interior spaces. It is clear that these level elements are created to meet human needs which represent the inner level and activities that represent the intermediate level. Meanwhile, there is a dynamic and mutual relationship among the three levels, and they influence each other. Moreover, Shore classified cultural schema into two groups, externalised schema, which is the public representation of schema in the form of cultural artefact or design. Furthermore, internalised schema, which refers to the cognitive representation of the externalised schema. These two groups always modify and interact with each other. This meaning is analogous to the spatial dimension of culture theory introduced by Siu and Ardila. The nature of culture schema is mostly unconscious, so it is not very easy to analyse. However, the analysis can be attempt via schema activation in response to stimuli matching to the three levels of culture.

Also, the three levels of design feature proposed by (Norman, 2007); visceral, behavioural and reflective as he pointed out that a successful design surpasses in three levels of emotional design – visceral level (appearance and appealing), behavioural level (functionality and performance), and reflective level (the meaning, self-image, and message of a product). Norman explained that visceral is the basic level that generates a prompt reaction, and it is related to appearance and delight to see a well-designed object or space. The visceral quality of space/product determines the first emotional relationship between the user and space/ product. Meanwhile, the behavioural level is related to the overall experience of using the space/product – functionality and performance - where appearance does not matter. The reflective level is the highest level of the emotional state of design; it is related to the message and the meaning of a design that is transferred to others and reflects the culture and self-image. (Marsha Aftab& Helen Agustin Rusli, 2017) see figure.1.
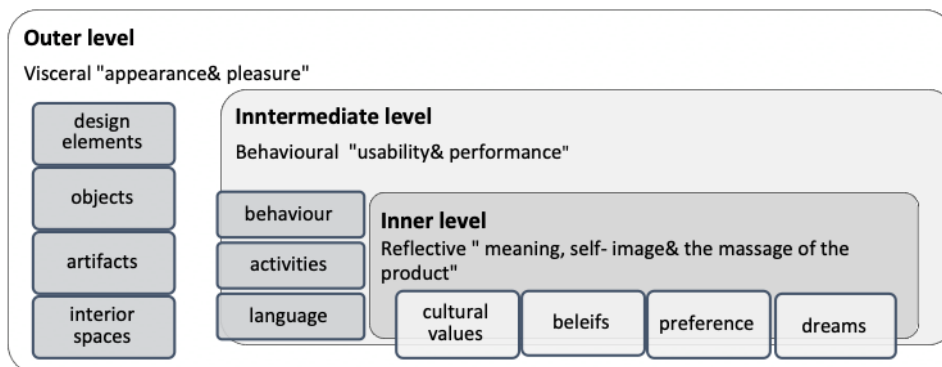

Figure 1. The Spatial dimension of culture& the three levels of design features

2.5.The interior design process as a creative problem- solving process

The creative problem-solving is defined as the process of generating creative ideas, the interpretation of these ideas, and the creation of the creative solution. This creative-cognition vision of creativity provides an essential base for investigating the interior design process as it depends on basic cognitive technique, such as memory retrieval and transformation, to describe how people produce new solutions (Smith et al,1995). Fundamentally, the creative process is the production of creative thoughts, the exploration and interpretation of the idea, and creating the design solution. The Geneplore model of Smit et al (1995) and the directed creativity cycle model of (Plsek*) (1997) were analysed to describe the interior design process as a creative cognitive process. These two models have been considered in this study and helped in exploring the creative cognitive process. According to Smith et al (1995), the Geneplore model suggests a framework to explain how human thought may evolve during the creative thought process. The creative process includes two phases; The generative phase and the exploratory phase. Throughout the generative phase, an individual set a cognitive representation known as a preventive structure, which has different properties that enhance creative thoughts. These properties are explored during a subsequent exploratory phase, in which the individual tries to understand and interpret the preventive structure in significative ways.

Moreover, Plsek (1997) splits this framework into four phases and applies them to Preparation, Imagination, Development, and Action. Starting with the -Living with It- quadrant, Plsek pointed out that

individuals live day-to-day in a similar context as all others (assimilation). However, creativity thought patterns begin with great attention to the details and the precise observation of their environment, combined with heedful investigations of specifically the ways things function and do not succeed. Most of these mental and emotional activities create a record of information within the memory(accommodation). Employing this record, most individuals build unique thoughts to satisfy specified requirements by purposefully seeking connections within configurations (Equilibration).

(Plesk*) stated that "attention should be given to pursuing equilibrium amidst a satisfying and untimely environment, and to reap and boost ideas prior to subjecting ideas to a conclusive end state" (Plesk 1997). Nevertheless, having imaginative thoughts is not enough; ideas are useless until it is put to work and executed. Finally, the Action phase of the framework explains that creative thoughts are worth on state that these are generally implemented in real life.

Based on the previously described method, the cognitive, creative process is the generation of the design solution, and it is sensational thinking that includes generative and exploratory phases. The identification of cognitive steps and structure are the core of this approach. That is, the creative cognitive process can be identified by investigating interior design because interior design is a cognitive process that involves creativity, synthesis, and problem- solving (Cross, 2001). Furthermore, the creative cognitive process can be explained by the investigation of the design studio. Therefore, the cognitive part of the creativity inside the design studio can be specified by creating a creative cognitive approach, see figure. 2.

* Paul Plsek is an internationally recognized advisor on creativity, innovation, leadership, and the management of change in complex systems.
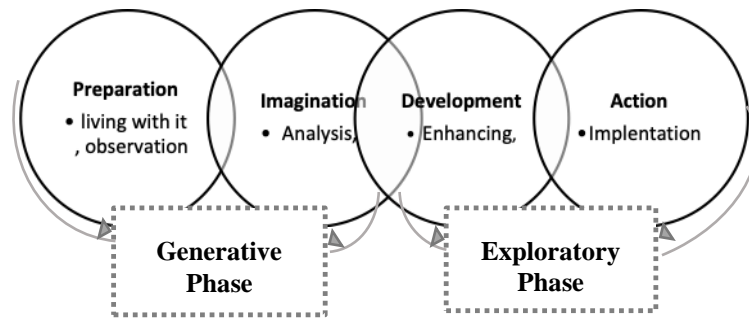

Figure 2 Interior Design as a creative problem - solving process
(adapted from Plsek, 1997& Smith etal.1995)

In the traditional project-based learning studio, students often have to answer a general question, to solve a concrete or well- defined problem. But, in the new design studio approach, students have usually given a real-world project that Leeds them to search knowledge and gain understanding away of their own professional territory and their comfort zones.

Creative problem solving is defined as a creative process that use both the divergent and convergent thinking, by creating as many options as possible (diverging) and then narrowing down into a number of promising ideas (converging). in the design studio student groups have to be encouraged to create "How Might We" questions as a way to input, to explore, and to suggest. These types of question will suggest that a solution is possible and offer the change to answer them in different ways. After that, the group members have to start brainstorming session as a creative thinking technique to create ideas. So that they can make a decision on which the highest score as the possible solutions. This kind of activity is depending on no judgment, to encourage as many ideas as possible, build on the ideas of others and stay focus on the target (Pham Tu Ngoc, Davide Fassi, 2018).

2.6.Design education and culture
Design education is not a structure that is focused on a one-dimensional and fixed teaching/learning process. Conversely, it is a kind of education that needs a framework that guides the design student to multi-dimensional and active thought processes (Cross, 2006). The design studio, as an essential element of the educational process, is recognised as a cognitive and social system, including knowledge and formation of knowledge structures with social interactions, where creativity is a core element. Creativity and the cognitive design process inside the studio are related to students 'cultural schemas.

According to Oxman (2001), There are four main factors that affect the design and the design studio; cognitive modelling, knowledge (and the formation of knowledge structures), representation, and reasoning. Cognitive modelling is the symbolic representation of phenomena in design. It is a didactic medium that enables the student to better comprehend the richness and complexity, as well as the formality, of thought in design. For example, modelling can be employed to formulate phenomena related to design, such as the approach of developing

and applying concepts, the speediness thinking with mental images, and the performance of solving problems and creating solutions using analogies. Representation involves the different symbolic representation of designs and their manipulation during design, mainly visual representations. Reasoning involves the symbolic representation and the processes of ideas generation in cognitive phenomena, for example, reasoning from historical design ideas (cases), reasoning with analogy and metaphor, or reasoning with visual images.

In the design studio, knowledge is exchanged and transmitted between student and educator. Active interaction between the educator and the student is essential in the design studio so that the messages are transmitted in an effective way (Uluoglu, 2000). By this way, the student builds structured representations of concepts and relate them to other ideas and fills the structures with the content of the specific design area or design scope. As a result of this process; structured representation of knowledge become clear as an important element to be taught and transferred in education. Through modelling, knowledge in its conceptual form and intellectual processes in the design are gained (Oxman, 2004). The study of design thinking has developed our understanding of the nature of knowledge based on research that has been conducted with different representational schemas. Galambosetal (1986) stated that "generally, representational schemas in the design are formal constructs for capturing, acquiring and representing types of knowledge structure used in design".

From this point of view, we can define the goal of the design studio as the attainment of design knowledge by focusing on cultural schemas, knowledge structures, and global strategies in design thinking. Through building representations of design thinking, the student progressively develops his/her skills to think in "designedly" ways. This development leads to an understanding of the cognitive processes that are characteristic of the design.

3. Model of the study

The literature review has highlighted the schema theory and the relationship between the designer's cultural schema and the design process in the design studio. In the design educational studies, these factors are studied separately, and the interactions among these factors are not analysed. This study attempted to investigate the cognitive process involved in designing local identity- based design by applying the suggested model in Interior Design studio. The model developed in combination with key elements from the following models:

- Schema-based information processing (Bruning, Schraw, Norby & Ronning, 2004)
- The spatial dimension of culture theory (Siu, K.W.M, 2005& Ardila, A., 2005)
- Directed creativity cycle (Plesk Working Paper: Creativity Models, 1997)

The model was constructed based on schema processing using three variables; generic schema, episodic in put& instantiated schema and their interaction with the design process as a creative problem- solving solution. In the framework, cultural schema acts as a generic schema, while episodic input represents stimuli related to the design problem. These variables represent the preparation/ generative phase in the creativity cycle. The interaction between cultural schema and stimuli activates schemata that result in the instantiated schema in the form of opportunities and constraints. Opportunities and constraints occur through the interaction between information derived from the interpretation of cultural/or historical design elements using the spatial dimension of culture theory and new information/ stimuli. Therefore, opportunities and constraints based on schema processing are needed to accommodate references other than

cultural or historical elements. This stage is parallel to the imagination phase in creativity cycle. The information of opportunities and constrains is to be applied to design process which involves syntheses and embedded (appropriation) of the information to produce a new design, which represents the enhancement and action stage in the creativity process, which produce an innovative design.
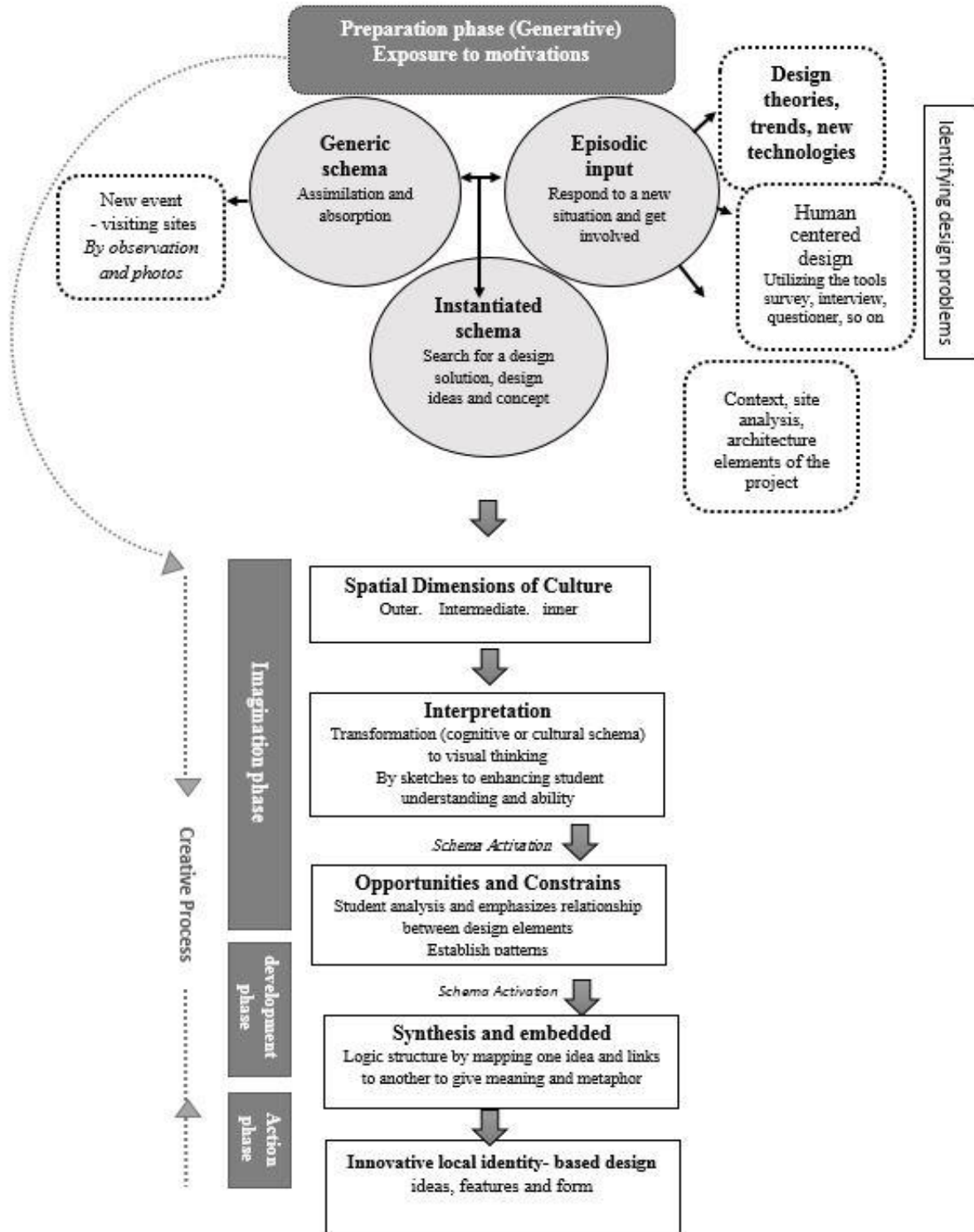

Figure 3. Model of the empirical study; local identity- based Interior design process

4. Empirical research

4.1. Experimental procedures

This experiment aimed at practising the application of local identity- based design model. This was done in the Interior Design department at faculty of Arts& Design, October University for Modern Sciences and Arts (MSA) at the academic year 2018-2019. With ten weeks allocated for Graduation project I (research phase) which was dedicated to establishing the parameters of the project, defining the design problem, and proposing an initial approach to addressing the problem, and 11 weeks allocated for Graduation Project II (design phase) that was dedicated to developing the proposed approach to fully designed interior project. Egypt Identity through Interior Design was the chosen theme for the graduation project this year in which 72 students were highly encouraged to thoroughly explore, analyse and study particular projects in Egypt and to integrate the research findings in an interior design project of a building of their own choice. The students were encouraged to create designs that strike a balance and introduce what can be argued as a contemporary Egyptian Interior Design identity that respects history, and socio-cultural aspects while open new visions for the future. The experiment was conducted in three phases:

4.1.1. Beginning: exposure to motivations.

The cultural schema theory was integrated into the design process. With the help of this theory, it was aimed to encourage students to come up with a creative concept and design by exposing them to various stimulants and motivations. Preliminary research established a student's involvement in the concept of culture and identity in interior design. Students were required, over a fixed time period, to conduct research to support individual identification and actively guide their thinking and structuring of their thoughts. At the first phase of the cultural schema theory, the students were asked to select a site exposing local identity in Egypt, visiting, and observing the exterior and interior while photographing their surroundings. Some even travelled to the destination of their selected site to spend days there which were geographically far, especially to Upper Egypt, the North Coast& Saini. Fully understanding and absorbing the site is the desired outcome, where students use their existing (generic) schemes to make sense of the new event. This process contains trying to understand a new event by fitting it into what they already know this is known as Generic schema, it contains established structural knowledge, skills, relations, behaviour, etc. and slots to accommodate new information for opening up creative possibilities. To achieve accommodation level and change of their existing schemas, they are asked to follow human-centred design methodology as a strategy for episodic input (information collected from the environment during the exposure to motivations). Then searching for design solutions, design ideas and concepts by organizing and repeating (retelling) the new information in visual, diagram and mapping forms. Exposure to motivation shed light on improving their ability to open up creative possibilities and produce an influential design.

4.1.2. Introducing spatial dimensions of Culture

In this stage, the instructors gave information about the spatial dimension of culture theory and how culture and heritage elements can be interpreted at three levels. Complete understanding and assimilation of the culture levels interpretations cannot be attained unless this process is followed by giving clear examples that explain how these levels can be interpreted in different

design projects. This stage was based mainly on visual materials and discussions. Moreover, a brainstorming session om interpreting cultural or historical space/ elements help in understanding the theory. The instructors introduced examples from Islamic and ancient Egyptian interior architecture. Mashrabiya was one of the examples introduced, as it was a result of cognitive activity to solve a problem related to the Arabic culture and belief of woman privacy. The woman should not be seen by strangers (inner level- belief) so that Mashrabiya was created as a veil for the woman that enables her to see the outside world without being seen from the outside people (intermediate level- behavioural). Consequently, Mashrabiya as a design element with famous wooden latticework is the outer level of the culture, see figure 4 (a), it was a tangible representation of the privacy meaning in Islam. Another example that was introduced to the students is the spatial sequence of the ancient Egyptian temple, the telescopic design of the space and the spatial sequence from the widest and the lightest (outside courtyard) to the narrowest (in-between halls)

until reaching the darkest space (Kods Al Akdas), see figure 4 (b). This space planning is a tangible representation of the God sanctification(inner level- belief) which was reflected on the (intermediate level- behavioural) as the public people were not allowed to go further the first courtyard, then elite people who was allowed to enter the second hall(narrower and less light) and so on across the spaces until the climax of the space (God room- Kods Al Akdas) the smallest and the darkest space where it was not allowed for anyone to enter except the priest (intermediate level). This spatial sequence of the typical temple interior space is the outer level of the inner and intermediate level of culture that gives the space the sense of mystery and dread which meet the ancient Egyptian belief of the greatness of the God.

In this stage, the students should understand that representation of culture manifests in both tangible and intangible ways, tangible representation of culture is the physical objects or tools that aid human life. Moreover, they should learn how to go beyond the superficial appearance of the cultural and historical elements and investigate the meaning, symbols and function behind the form and the shape.

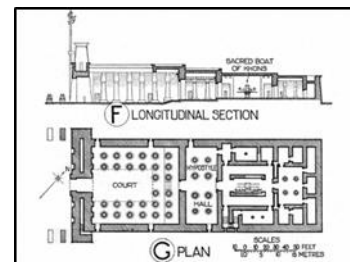**Figure 4 (a) Mashrabiya reflects the inner level of Islamic culture.**

Figure 4 (b) the typical ancient Egyptian temple (Historic illustration of Art& Architecture)

4.1.3. Interpretation, opportunities and constraints

The Cognitive process of interpretation allows the students to creatively explore different ideas and variations of concepts in early design phases. In this stage, the student processed the collected information a second time, but in a different manner. The analysis went far beyond just relating the collected information to the design problems. Cultural and historical design elements (space form, architectural elements, colour, material, space planning, and so on.,) serve as a reference in the design process. Culture schema as a previous knowledge serve out as a point of reference in the design process, which involves the interpretation through

activating the cultural schema. The result is that information about cultural reference regarding its visual, behavioural and symbolic value is referenced in the new design.

The interpretation process provides the students with information about opportunities and constraints, posed by culture and its relationship with the cultural elements. The information resulting from interpretation process undergoes transformation, elaboration and rejection (Uysal, 2012). Opportunities and constraints are perceived differently in the context of new information in the form of the design problem and design objective. Corresponding to the process in the suggested model in figure .3., an interaction between cultural schema in the form of information resulting from activating schemata in the interpretation process and new information in the form of the design problem and human- centred design study results (episodic input) occurs in the instantiated schema in a form of opportunities and constraints which would be utilized to create new design ideas.

The outcome of this stage is considered as the point of departure for generating a schematic concept. Through sketching different interpretations and expressions of the design imperatives, the student can decide on the starting point of generating the schematic concept. Freehand sketching, in the form of 2D/ 3D was the main tool for this stage. Collaboration between the students and the instructors was manipulated to explain visual thinking from the design perspective as the cognitive activity behind the creation of ideas, concepts and forms in design (Goldschmidt, 1994) (Goldschmidt, 2001). To handle different levels of metaphor through the sketching tool, cultural schema is involved in planning and analysing forms to achieve meaning. A workshop had been organized for three classes to allow students to experience the design by their own and to stimulate their thinking skills. During this workshop, freehand Sketches serve as a retelling or reforming of local identity and helps store more material through these visualizations.

4.1.4. Synthesis and embedded design

In this stage, the information of opportunities and constraints posed by cultural schema is to be applied in the design process to produce design solutions and new interior design features. At this stage the schematic concept is developed and crystalized through developing from schematic concept to schematic design, then reaching to the interior design and presenting it in a two- and three-dimensional scale drawings and models. It is the stage in which raw information and partial solutions are integrated. They involve creative thinking, generating alternative solutions, and comparing the solutions with their acceptability for shape and requirements. However, it is not sufficient to have imaginative thoughts; ideas do not have any benefit where it is put to work and implemented in the interior space. Creative ideas have worth on condition that these are generally executed in real life.

Students synthesized images from their own freehand sketches and activate image schema (as discussed before is a repeated frequently format within cognitive processes which establish patterns of understanding). Each student will build interior environment depending on his/her image schema and the spatial dimension of culture in his/her concept; as a result, each student individually moulds their interior design with a set of predefined rules establishing their own pattern, even if the background of their design comes from the same identity (the most local identities they sought were ancient Egyptian heritage, Islamic heritage, and Nubian heritage). The students present their work through this stage in a digital presentation form.

4.2. Results and discussions

The students' grades of the final projects were analysed based on their dealing with the culture level (outer level -intermediate level - inner level) the students in the inner level demonstrate high levels of creativity and potential to present novel design solutions. The student grades& final work showed strong evidence of a positive correlation between both of schema theory and the spatial dimension of culture theory as cognitive culture knowledge and taking appropriate cultural-based design decisions.

While one of the main criteria in evaluating final projects is the level of creativity, the design studio is one of the most progressive teaching methods for increasing creativity and expands the boundaries of motivations. Students are expected to complete each phase of the design processes within the given time. At the end of the spring semester graduation design course period, qualitative assessment for the final projects had been made by four expert examiners. Course instructors arranged a jury rubric specifying the assessment criteria for each phase of the design. The quantitative results of an empirical study that are required to introduce and utilise schema theory and spatial dimensions of Culture raise design creative possibilities and help visual thinking through local identity and architectural heritage as a valid platform for design education. Based on the assessments, observations had been made about the changes that happened in students' thinking about design, their growing skills to deal with the complexities of design thinking and the dynamic development of their design performance.

The students' grades of the final projects were analysed based on their dealing with the culture level study; the data revealed that 37 students in dealing with the outer level of culture- making up 51% of the total, 15 students in the inner level making up 21%, and 20 students in the intermediate level making up 28% of the total. This is shown in the below chart in percentages. The results of their grades are shown in the bar charts below in figure 5(b).
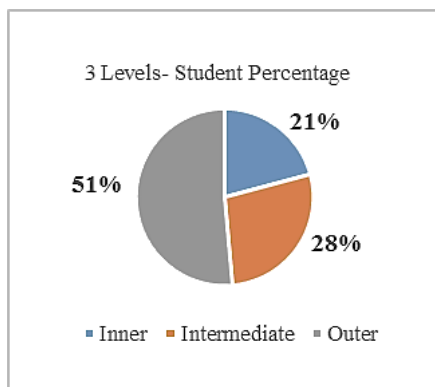
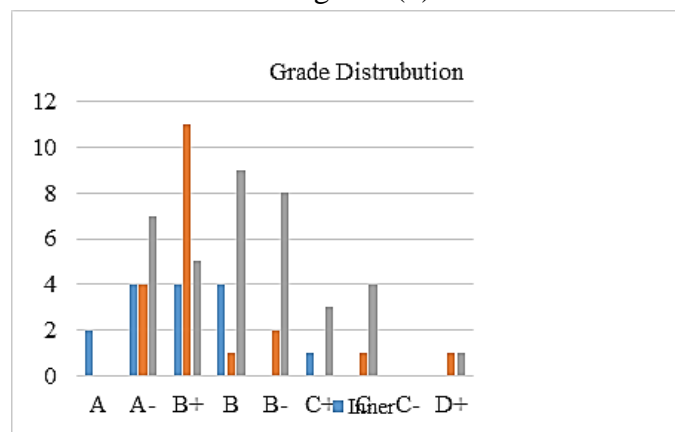

Figure 5 (a) Percentage of the three levels   **Figure 5 (b) Grades of the three levels**

Collected data in figure 5(b) shows the **inner** division was the only division to host students that scored an A grade, and most of the inner division scored highly. As observed from the grades in the chart, most of the students who adapted the inner level of the theory scored highly relative to the others. No one scored less than C+; students who scored C+ were outliers. Analyzing the below inner level scores figure

6. clearly we can see that 35% of the 15 students, more than third, scored A and A-.18% of the 15-student scored in the B's. Almost only the tenth of the 15 students only scored C's, and none got D's.
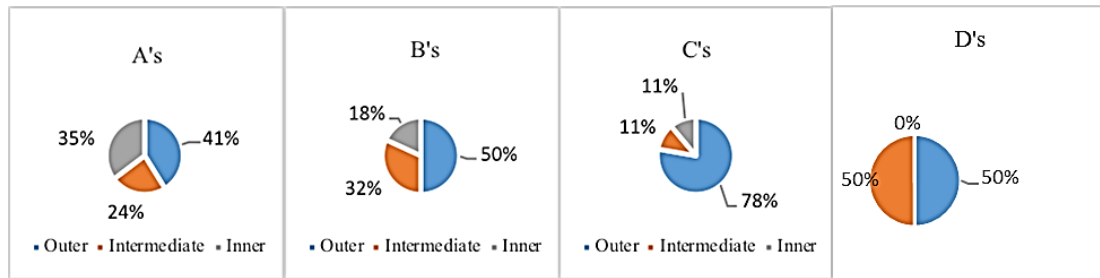
Figure 6. Grades percentage for each level

Students in the **intermediate** division were generally scattered but scored relatively less than the inner division, most scored average scores in the B's. Most students who adapted the intermediate level scored B's, only 4 out of the 20 intermediate students scored A-, and none scored A; which mean that quarter of the 20 intermediate students scored A's, a third got B's and tenth got C's.

Students in the **outer** division scoring relatively less than both inner and intermediate levels, none got A. This division hosted the greatest number of C's. Students who got D's were outliers. Although they were the majority of 37 students among all the levels, only seven students got A-. In the C's they were three-quarters of all the C's combined. It can be seen that through A to D grades the number of students in the inner level keep getting less until zero in the D, on the other hand, the number of students in the outer level leans towards increasing. Although the number of students in the inner level (15) is less than the intermediate (20) and outer (37) levels, they still achieved the most A's. This indicates that the students in the inner level demonstrate high levels of creativity and potential to present novel design solutions, consequently creativity as a mental process that cannot be separated from the socio-cultural systems.

Analyzing examples of students' work based on the theory of the spatial dimension of culture

Examples of students' work were analyzed in terms of the level of culture that students deal with, and the design concept, see table 1. The selected examples show that the projects that deal with the inner& intermediate level of culture were more innovative in their final design than that deal with the outer level (shapes and motives).

Table 1. Example of students' work reflects the inner level

Spatial dimension of culture	Inner level: includes beliefs, values, preferences and other psychological aspects
Student Work	**Oplisco captale world class spa** The significant of The spa is up in the sky with nothing but air surrounding it.

	Design: - The student retold the form by modifying and taking advantage of the sacred ancient Egyptians.
Analysis based on on schema theory and spatial dimensions of Culture	**Inner level**: Ancient Egyptian beliefs of "flower of, life, light & dark energies. and the theory of celestial Nile" Therefore, there are two main sources of exteriors: the sun the moon and stars. This helped visualize a concept that was deeply rooted and linked to the ancient Egyptians and their close and sacred relationship to the sun, moon and close and sacred relationship to the sun, moon and constellations. Curved and spiral lines:(on the plan translated as hallways, bench forms, circulation and walls). These organic forms were translated from the female energy path which according to the Ancient Egyptians and the flower of life: females composed energy was translated into curved and spiral lines that stretched out to the center of the galaxy. While male energy was composed of sharp, straight and 90-degree angled lines.

Table 2. Example of students' work reflects the intermediate level

Spatial dimension of culture	Intermediate level: vendor's behaviour. Reference element is the traditional cart vendors inherited through time until today
	Commercial market in Elsheikh Zayed city
Student work	
Analysis based on schema theory and spatial dimensions of Culture	**Commercial market project.** The significant function of the cart is that it is tilted at an angel toward the customer. **Design: -**The student retold the form by modifying and taking advantage of its berks. He turned it into a double-sided cart and he designed a unifying umbrella. The cart was the key for the vendor's occupied area. **Intermediate level Control the vendor's behavior: -** He implemented the area occupied by vendors turning it into a square with one side entrance to control the vendor's behavior and the disposal of waste. This kind of constraints limits their activity to one place and controls their behavior. The design of the square booth ensures that the booth will be completely occupied by the products neatly, without allowing the vendors to display randomly. The booth was used as a building block for the modular plan. When implemented, the booths allowed for ease of accessibility within the entire plan of the market.

Table 3. Example of students' work reflects the outer level

Spatial dimension of culture	Outer level: consists of artefacts, objects, design elements and interior spaces. "Crown of King Mina& ancient Egyptian eagle"
Student work	**The central library of Al-Al Almeen city** The significant artefact of the project isThe crown of the King Mina.
Analysis based on on schema theory and spatial dimensions of Culture	**The central library of Al- Almeen city** The significant artefact of the project is the crown of the King Mina. **Design: -**The crown of the King Mina and ancient Egyptian eagle was the reference elements of this project, the panoramic elevator at the centre of the reading hall was formed through modifying the crown form. **Outer level: -**The Egyptian eagle had been chosen in designing the ceiling of the hall. Visceral level was the tool that had been used in this project, it is the most basic level that creates immediate response and it is associated with appearance through making some modification to the original element. It is an indirect quotation of the original shape. It is considered the simplest way in dealing with the cultural and historical elements and has a less design effort and intellectual abilities.

The student grades& final work showed strong evidence of a positive correlation between both of schema theory and the spatial dimension of culture theory as cognitive culture knowledge and taking appropriate cultural-based design decisions. Also, results indicate that to explain

complex contemporary design solutions, one must address issues related to socio-culture responsibility. The percentage of the students in each level (21% inner, 28% intermediate & 51% outer) indicated that dealing with the inner& intermediate level of culture needs more effort and high intellectual abilities than dealing with the outer level and dealing with inner& intermediate level of culture was an effective tool in transforming culture to novel designs that overtake the superficial features of the cultural and historical elements and take the design thought to another level of maturity in dealing with the culture and heritage.

Further analysis showed that the framework had been shaped as a solid, reasonable and valuable strategy of dealing with creative contemporary design solutions has improved students' interpretation of culture and local identity through interior design studio by adapting cultural schema theory in a sequential and dynamic way.

5. Conclusion

Innovation design solutions are multi-layered, requiring many standpoints; that's why the aim of this study is to achieve experience in using schema theory to support creativity. The theory had been integrated into the sequential phases of the design process. Through extensive and in-depth research and application, the authors developed a model for the design process to develop local identity based interior designs through the design studio. The framework accommodates factors which arrange the groundwork for how to interpret the cultural meaning through the interior design process. Through the presented framework, various motivations were included, targeting develops a higher level of cognition and obtains different perspectives. The significance of the study is adapting an advance approach by merging between theoretic and active phases of a constructed framework to encourage imaginative interior design education and to establish an example for expanding the boundaries of interior design.

In other words, our goal is not to prepare professionals who apply the conventional design process to create an interior space. However, as interior design educators, our goal is to make something greater; new generation of interior designers who do not only generate more developed solutions of current thinking, but who utilize their cultural schema and interpret the inner and intermediate levels of culture to generate novel designs that give the spaces their local identity and enrich the life of its users in the current century.

Acknowledgements

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