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## RETHINKING THE EPISTEMOLOGY AND LEARNING PROCESS IN CONTEMPORARY DESIGNSTUDIO - A CONSTRUCTIONIST APPROACH

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## Abstract

The paper examines the epistemology and learning process in the contemporary design studio. It provides a particular focus on the learners' engagement level and their ability to integrate their acquired knowledge in a systemic approach that enables them to create innovative yet authentic settings and products. In this context, the authors investigate the impacts of two aspects on the design process, the design outcome and the overall learning quality. These aspects are narrowed down to :1- the learning environment and theories as implemented in design studios, and 2- the perceptual behavior and its related variables as integrated in the design process. Thus, the paper tackles the possibilities to profit from the traditional and contemporary resources of constructionist learning theory and styles, as well as environmental perception and affordance to restructure the learning environment and the design process in a way that draws the best out of every learner's cognitive potential. For this purpose, it suggests a conceptual model for learning in design studio, i.e., the Perceptual-Based Design Model. The model, along with its pedagogical tactics, adopts a constructionist-learning standpoint that has been implemented throughout the last 8 years on undergraduate junior and senior interior design students. It allows an inclusive strategy to interpret the users' expected readings of their indoor and outdoor tone with into a set of appropriate design considerations that are in harmony with the cultural, social and environmental attributes of these settings and engenders positive users' experiences.

## Keywords

Epistemology, Constructionism, Perceptual behavior, Perceptual-Based Design Model

# RETHINKING THE EPISTEMOLOGY AND LEARNING PROCESS IN CONTEMPORARY DESIGN STUDIO - A CONSTRUCTIONIST APPROACH

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## ABSTRACT

*The paper examines the epistemology and learning process in the contemporary design studio. It provides a particular focus on the learners' engagement level and their ability to integrate their acquired knowledge in a systemic approach that enables them to create innovative yet authentic settings and products. In this context, the authors investigate the impacts of two aspects on the design process, the design outcome and the overall learning quality. These aspects are narrowed down to :1- the learning environment and theories as implemented in design studios, and 2- the perceptual behavior and its related variables as integrated in the design process. Thus, the paper tackles the possibilities to profit from the traditional and contemporary resources of constructionist learning theory and styles, as well as environmental perception and affordance to restructure the learning environment and the design process in a way that draws the best out of every learner's cognitive potential. For this purpose, it suggests a conceptual model for learning in design studio, i.e., the Perceptual-Based Design Model. The model, along with its pedagogical tactics, adopts a constructionist-learning standpoint that has been implemented throughout the last 8 years on undergraduate junior and senior interior design students. It allows an inclusive strategy to interpret the users' expected readings of their indoor and outdoor tone with into a set of appropriate design considerations that are in harmony with the cultural, social and environmental attributes of these settings and engenders positive users' experiences.*

## KEYWORDS

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## 1. INTRODUCTION

The design studio has always been the spine of the design learning in terms of its process, theories and the styles of learning. It remains the mainstay of the design education and functions as a communication center for its participants. In a successful design studio, designers are able to synthesize all fundamental, technology-based and artistic knowledge that is accumulated from other design courses to create original settings.

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The present report reflects on the theory that underpins the learning process in existing design studios. It aims to analyze the current learning process at the core of the design studio. It focuses on three main aspects: the level of engagement of the learners, their abilities to construct and to tackle their own knowledge in a comprehensive way while aiming to create innovative and authentic settings and products and finally their potentials to communicate and to advocate their ideas at every single phase of the design process.

To begin with, the report will situate the design studio in its theoretical context. Two main aspects are described and analyzed in terms of their impact on the design process, the design outcome and the overall learning quality. These aspects are: (1) the learning environment and theories as implemented in design studios while focusing on constructivist standpoints and related practices and styles and (2) the environmental perception and their related variables. This section is concluded with a discussion of the shortcomings of the current theories and practices and the possibilities to use the collective findings to restructure the design process to improve the learning environment in all its aspects.

Accordingly, the report seeks to generate a conceptual model that serves as a context within which designers construct the knowledge that guides their reasoning and instigates their decisions and actions. The model and its pedagogical strategies adopt a constructionist standpoint. It allows design students, whether junior or senior, to construct and restore their knowledge of environmental/behavioral experience gradually, with the aim of creating authentic experiences for expected users from specific theoretical perspectives and to express them via appropriate media.

## **2. THE THEORETICAL BACKGROUND**

In order to provide a solid foundation for creating positive individual experiences, the design process should embrace comprehensive knowledge related to the perceptual behavior of the expected users. Meanwhile knowledge is interpreted into design experience that fits with users' expectations. In this regard, it should allow the arrangement of the variables of the physical environment to shape a reality with different yet positive readings by all users regardless of their cultural and social backgrounds as well as their aspirations and needs in this setting.

### **2.1 The Learning Environment**

In order to provide a comprehensive ground for design problem-solving, the learning approaches and related design process should enable learners to fully organize and implement their acquired knowledge properly and comprehensively. Besides, the design process should embrace environmental/behavioral relationships while interpreting these relationships into design experience that fits with users' expectations. In that case, it should enable the arrangement of the variables of the physical environment to shape a reality with different yet positive readings by all users regardless of their cultural and social backgrounds as well as their aspirations and needs in this setting. Nevertheless, the theories and practices related to the user-centered design process do not systematically support these two main issues.

Learning as described in the literature review is a student-centered procedure and outcome that embraces all knowledge and skills of an individual who is engaged with her or his environment. Learning can be affected by various aspects including internal aspects (e.g., learner's individuality, abilities and talents) and/or external aspects (the pedagogues' ways of thinking, the objectives of the educational program and the educational and social environment) (Kearsley, 1994).

During the last decades, new styles, techniques, terminologies and theories were integrated in the curriculum of design education. An increasing number of researchers have tackled the complexity of the human brain and its potential strengths to foster creativity (e.g., Mallgrave, 10). They draw upon the necessity for design training and appropriate medium to develop such strengths. Some recent studies have analyzed the design education and the effects of the learning styles on design students within the design studio process (Demirbas and Demirkan, 03, 07; Tidafi, 08; Dorta, 08).

Other studies highlighted the role played by the instructors' perception of creativity and intellect in the teaching process and outcome (Ackermann, 09). As shown in figure 1, the impact of instructors' perception on the design curriculum are in most cases at the expense of disregarding the needs and capabilities of many of the students or of time and effort consuming teaching methods that do not lead to desired learning outcomes.

<b>INSTRUCTORS PERCEPTION</b>		<b>LEARNING PROCESS AND OUTCOME</b>
1	Creativity and intelligence are innate aspects of the learner	To focus at helping learners reveal and develop their potentials while overlooking the so-called "untalented"
2	Creativity and intelligence are the results of the learners surrounding	To endorse instructors' way of thinking, system, and values, to learners while underestimating and overlooking their opinions and liability.
3	Creativity and intelligence are a dynamic construct of the learners while dealing with their surroundings.	To let learners embark on practical studies to motivate the constructive process while enabling their drift away while shortcuts exist.

Fig. 1 Relationship between instructors' perception and the learning process and outcome  
Reference: Adapted from Ackermann, 2009

The same study distinguished between conventional and modern learning approach in terms of the learners and the pedagogues eventual relationships and related roles (see Figure 2).

	<b>PEDAGOGUES' ROLES</b>	<b>LEARNERS' ROLES</b>
<b>CONVENTIONAL APPROACH</b>	To submit information; To transmit one's ideas and values.	To acquire, encode, memorize, retrieve, and apply the submitted information; To comply with instructor's ideas and values.
<b>MODERN APPROACH</b>	To enable learners to perform the following tasks in sync with their current needs and possibilities with others.	To put one's own words to the world; To put one's own voice; To exchange one's ideas To develop, to shape and to sharpen ideas; To do and to think with integrity, a "logic" of its own.

Fig. 2 The impact of the conventional and modern learning approaches on pedagogues and learners' roles and responsibilities.  
Reference: Adapted from Ackermann, 2009

According to this figure, designers with limited freedom and whose learning and knowledge are based on and transmitted from conformist standards and restricted design tactics, are unable to design for varying groups of users and to harmonize their interactions with their surrounding environment as well as with the other users.

The literature review has provided us with ample knowledge related to learning theories. Three main learning theories have been identified: the behavioral learning, the cognitive learning and the constructivist learning. Figure 3 shows the main distinctions between each theory in terms of their definitions, the nature of the instructions, the teachers and the learners' roles as well as their weakness and strength.

As shown in the figure, the learning approaches and styles have considerable impacts on the development and the final outcomes of the design studio. On one hand, as students of the traditional studios have no choice but to abide by the instructors' standpoint, system, and values, the design process and outcomes impersonate the tradition of thoughts and the performance of these instructors with less potential for originality and diversity (Ackermann, 2009).

On the other hand, it can be claimed that the constructivist learning approach is an effective approach that offers a theoretical standpoint for learning in design studios that has a remarkable prospective for the design studio. It overcomes the disadvantages of the traditional approach since it offers a learning environment that enables students and their teachers to advance in critical thinking, communication and creativity (Carey, 87; Demirbaş et Al., 03; Papert, 91; Powers, 01).

The constructivist approach, asserts theoretically that learners should be independent thinker and designer that are able to analyze and to build their own perception of the existing knowledge and to use them to construct their external reality. However, the literature didn't cover appropriately the practical side of this approach and always offers an undetermined and ambiguous picture to the appropriate constructionist design process that provides the student with a comprehensive model of the information process and of the varied plans of action that comply with the needs and aspirations of the designers.

Furthermore, the constructivist learning emphasizes the use of external medium as "objects to think with". In relation to this issue, the persistent struggle between the advocators of the traditional medium and those of the digital ones helps to discriminate the advantage and disadvantage of each medium. In fact, many studies have focused on digital medium as tools for ideation (active) rather than for communication (passive) in order to overcome its disadvantages (Dorta, 08; Tidafi et Al., 08).

However, few studies have proposed the appropriate means and tactics to integrate the design knowledge and trends in the ideation process itself. This absence of a clear strategy is an obvious defect of constructionism. It prevents the students from realizing their capabilities and their limitations. It also prohibits them from thinking holistically to determine the action plan and its implementation. This deficit becomes visible in learning processes that adopt a user-centered approach and where learners should put themselves in potential users' shoes to predict their needs, hopes and aspirations. Accordingly, most constructivist approaches appear to be shallow and disengaged from reality as students fail to incorporate all related knowledge, theories and findings related to user's environment transactions into the design process.

In order for the cyclic stage of constructive learning to engender better knowledge outcomes, Jonassen (97) suggested that learners, especially the beginners, should be integrated in "well structured" learning environments. The author opposes the idea of allowing novices to interact with ill-structured learning environments since they rely heavily on the learner abilities to discover problem solutions (Jonassen, 97).

	BEHAVIORISM	COGNITIVISM	CONSTRUCTIVISM
DEFINITION	Deterministic approach: (Musa said to him, 'should I remain with you on the condition that you will teach me of the right things which you have been taught). (Surat Al Kahf.66). Derived from observable changes in behavioral pattern attributable (response) to external environmental conditions (stimulus) set by instructors. These patterns should be repeated until it becomes customary.	Inquiry- Oriented approach. Based on Behaviorism but put great emphasis on the cognitive development behind learning (the ways knowledge can be obtained, arranged, stored, and recovered by the learner's mind). .	Learner-centered approach where learners construct their own standpoint of the world, via personal practice and system.
INSTRUCTIONS	To generate discernible and quantifiable results in students' performance to control and to shape the "stimulus-response association". (Ertmer & Newby, 1993).	Facilitating the optimal learning processing and that highlight active involvement of the learner in the learning process especially the connection of previous acquired knowledge. (Ertmer & Newby, 1993).	Flexible elaboration and interpretation of preexisting knowledge with no recalling of predefined systems of knowledge processes (Spiro, Feltovich, Jacobson, & Coulson, 1991). An emphasis on the identification of the Contexts should be designed to give learner full control to manipulate knowledge and skills, to take plans of action and to choose various means to present the outcome (Ertmer & Newby, 1993).
ROLE OF THE TEACHERS	To establish and to arrange stimulus (knowledge, practice, environmental conditions) that insure desired responses (Gropper, 1987).	To determine the most effective learning environment. However the goal of this stimulus-response strategy is to enable learners to extract their previously acquired knowledge, abilities, and experiences and to bring various learning experiences which impact learning outcomes that assimilate effectively within the learner's cognitive structure (Stepich & Newby, 1988).	To help learners construct meaning of their external realities and to design context for the learner so that authentic relevant task can be experienced.
ROLE OF THE LEARNERS	Reactive to conditions in the learning environments.	Contrary to behaviorism, the learner is characterized as being an active processor of knowledge.	Knowledge process, practice and representation that can be facilitated by taking part in reliable assignments related to contexts (Brown, Collins, & Duguid, 1989).
WEAKNESS	As learners are only reacting to outer incentives, once these later do not occur, the learner cannot respond.	Prearranged and definite knowledge. The means taught to accomplish specific task may not be suited for the learners or the situations and do not comprise or justify distinctiveness.	There are conformity is essential divergent thinking and action situations where consistency is the best action.
STRENGTH	Automatic and straightforward response to clear and defined goals.	Enabling consistency to avoid problems.	Learning to interpret multiple realities and to be able to deal with real life situations. If a learner can problem solve, they may better apply their existing knowledge to a novel situation (Schuman, 1996).

Fig. 3 Comparative analysis between behaviorism, cognitivism and constructivism learning theories

## 2.2 Perception and Design

Several studies have explored the users' perceptions of their surrounding environment and its impact on the design process. In fact, in order to provide a solid foundation for creating positive individual experiences, the design process should embrace comprehensively related knowledge to the perceptual behavior of the expected users, while interpreting the knowledge into design experience that fits with users' expectations. In this regard, it should enable the arrangement of the variables of the physical environment to shape a reality with different yet positive readings by all users regardless of their cultural and social backgrounds as well as their aspirations and needs in this setting.

Perception is a process that enables people to become aware of the surrounding environmental factors and to organize and analyze their sensory impressions and eventually to associate significance with this environment (Pomerantz, 03). Perception involves "top-down" as well as "bottom-up" processes of sensory input. The bottom-up processing is "... the aspects of recognition that depend first on information about stimuli that come up to the brain from the sensory system". The top-down processing "... illustrates that our experiences create schemas, mental representations of what we know and expect about the world" (Bernstein, 10, p. 123). Those different inputs generate perceptions of settings that vary from one person to another and similarly do the significance of the settings.

The Gibsonian Theory of affordance emphasizes that all users' actions are driven by the way they perceive their environment. Gibson matched human behavior and theories of perception as he developed an interactionist view of perception and action that focused on information driven by the surrounding environment (Gibson, 77, 79). This approach embraces an interactionist view of perception and action that focuses on information that is available in the environment. It has led to the development of the idea of affordances, which gives attention to processes of person-environment interactions and defines persons' ability to perform any given activities in terms of the level of one's adjustments to directly perceived or recognized constraints. Likewise, the Performance Prediction Model introduced by El Kony et al. (2004) supports the affordance theory as it assumes that the physical environment can afford either desirable or undesirable outcomes for an individual. It also claims that the outcomes afforded, whether experiential (affection, perceptual) or behavioral (functional), depend on the characteristics of the environment relative to the personal characteristics and the functional abilities of its individual users (Figure 4). This perception can lead to identifying and describing the surrounding environmental elements based on their association with varying influences. Similarly, Meinig (1979) states that the reading of any setting "is composed not only of what lies before our eyes but what lies within our heads" (Meinig, 1979, p. 10). In this context, Meinig offers 10 perceptual ways of reading static or movable scenes by potential viewers (i.e., problem, wealth, system, habitat, nature, aesthetic, ideology, history, artifact and place) (Meinig 1979; Motloch, 01).

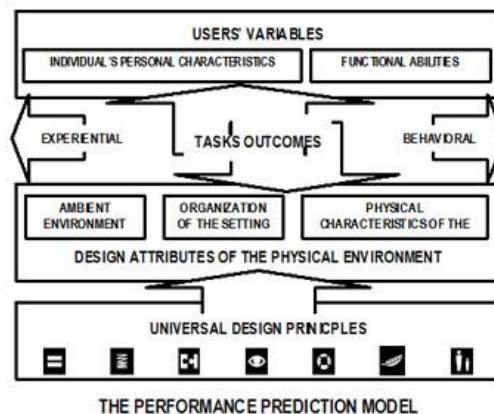


Fig. 4 The Performance Prediction Model,  
Reference: El Kony et Al. 2008



These influences include not only visually detected elements (e.g., object, layout, spatial relationships, etc.), but also associations with social factors (e.g., place identity, legibility, behavior, etc.) and cultural factors (e.g., personal, ethnical, global). These latter transform directly and immediately the physical entities into sets of ideas and information, transmit them to a variety of recipients and, eventually, lead to the potential actions of these recipients (Gibson, 77, 79; Meinig, 79). In this case, the visual process should be identified and analyzed as a way of thinking that “rests primarily in what different thoughts are about, rather than the form that they take” (Pylyshyn, 99, p. 113). The same author states that “... contemporary discussions of mental imagery often confound questions of form with questions of content. There is clearly a difference between thinking about how something looks and thinking about what it means” (Pylyshyn, 99, p. 113).

The visual processing of any setting includes two phases (Motloch, 2001): (1) the denotation of the elements of the physical environment of this setting in terms of their physical attributes (e.g., brightness, movement, color, objects, etc.) and (2) the association of meanings with these elements that are fitted together according to some coherent body of ideas related to each use, i.e., the investigating of the non-visual properties of the settings. The first phase is due to the invariant and coherent nature of the physical elements; we may expect direct and relatively constant reflections from users. According to Pylyshyn, this phase is called the “early vision” and does not involve any cognitive procedure related to the perceiver’s relevant expectations, knowledge and utilities (Pylyshyn, 1999). On the contrary, an associate meaning is a mental process that links the snapshot to unlimited internal influences and cognitive procedure, and produces behavioral and experiential outcomes that are reflected on and perceived in the settings. This phase is complex as it leads the visual process to phases of attention, evaluation, selection and inferences that retrieve the perceivers’ long-term memory and affect their appreciation and output emotions regarding the setting (Pylyshyn, 1999).

There are several references that help to grasp the environmental variables that affect the users’ perception (Ching, 2007, Alexander et al. 1977, 1979). A major one was introduced by the UNESCO World Heritage Centre. The study indicates that a “setting” should be understood with regard to a “context” where all associated tangible and intangible cultural elements must be integrated (UNESCO, WHC. 05/2- 2 February 2005, p. 21).

The aforementioned literature provides design-related learners and professionals with a rich understanding of the impact of environmental affordance on users’ perceptions, as well as the individual users’ transactions with physical environments’ features and the tangible and intangible attributes that affect their environmental perception and communication. Nevertheless, the presented theories and practices did not support a perceptual user-centered design process that enables the creation of authentic experience in a comprehensive and systemic way. In fact, not many studies have attempted to elaborate a comprehensive framework for design process that integrates these attributes in the design process and to study the impact of this integration on the design outcome. In this same context, although Meinig suggested 10 perceptual ways of reading static or movable scenes by potential viewers, he did not underline any strategy to put these readings into operation (to interpret the complex behavioral stages allow users to translate any scene into guidelines that integrate e/b findings of optics, psychology, epistemology, or culture into the design process). He also did not suggest how these findings can be communicated easily to future designers especially novices.

Following the same logic, the Performance Prediction Model offers a methodical reading of the environmental affordance. However, it focuses exclusively on the performance of the physical setting, while disregarding its cultural and social attributes. Therefore, for a more comprehensive reading of the environmental affordance, the authors suggest that this model should expand its environmental variables to include the social and cultural variables of the environment. It also should include the important personal factors that direct the users’ perception and attitude.

In consideration of what has been previously mentioned, the authors assert the significance of providing a self-directed conceptual framework for designing indoors and outdoors, that acknowledges environmental affordance on users' perceptions and enables designers to deduce the tangible and intangible attributes necessary to adjust individual users' transactions with the features of the physical environments. This conceptual framework should serve as a platform to provide relevant information, and to incorporate within a structured system of knowledge for designers.

The conceptual model and related tactics should enable learners and designers to acquire the necessary skills to perform the following tasks:

- To understand and to define the setting's tangible and intangible factors affecting the potential users' experience (i.e., the experiential and behavioral outcome of their potential users);
- To develop concepts and ideas that reflect these factors in their design process;
- To draw special understanding and critiques vis-à-vis the setting's issues and suggest related problem-solving agendas and methodologies.

### 3. THE CONCEPTUAL MODEL

The conceptual model, i.e., the Perceptual-Based Design Model (PBDM), is based on theories related to perceptual abilities of potential users particularly (1) Meinig's study on reading the landscape as expressions of history and culture and (2) Gibson's theory of affordance as interpreted in the Performance Prediction Model. It serves as an organizational and managerial context that help learners to easily integrate their previous acquired information and knowledge, to categorize its content and to bring into play related concepts and solutions in order to develop innovative design solutions that meet with their pre-identified goals in a comprehensive and structured manner.

The PBDM enables a knowledge process where learners are trained to predict environmental circumstances and to be responsive to their variables. It claims that, with the wide variation of people's characteristics, needs and perceptions, authentic settings and products can be perceived and examined via multifaceted ways and thus identifies and assesses material attributes as physical representations of deeply held values and priorities. Thus, a successful design should manifest ecological, technological and cultural influences and engender enriched experiences while helping people reveal and interpret the meaning of these influences whether they are perceptual or associational.

As shown in figure (5), the model incorporates the 10 perceptual paths of Meinig as new dimensions defining the varying reading of the tangible and intangible environmental attributes that insure a coping relationship between the environment and the potential users' perception (see Figure 5). The ten perceptual paths are used to justify the setting with its design elements, composition and meanings as they describe the diversity of readings that users, whether professionals or non-professionals, are likely to recognize and appreciate. Therefore, each designer should define the design objectives and the appropriate ways to reach them. Therefore, in order to evaluate the final design, we must know what has been achieved and the extent to which the outcome is linked to these objectives.

The PBDM framework recognizes the following issues:

- 1- The goals of all parties concerned with the settings in questions that may have effects of its configuration;
- 2- The tangible and intangible environmental factors that define a setting and the challenges they present to the designers;
- 3- The variant and complex modes potential users perceive, describe and experience their surrounding settings;
- 4- The design considerations that emerge variant readings and observations compatible with that of the potential users of the building.

## THE THEORETICAL FRAMEWORK

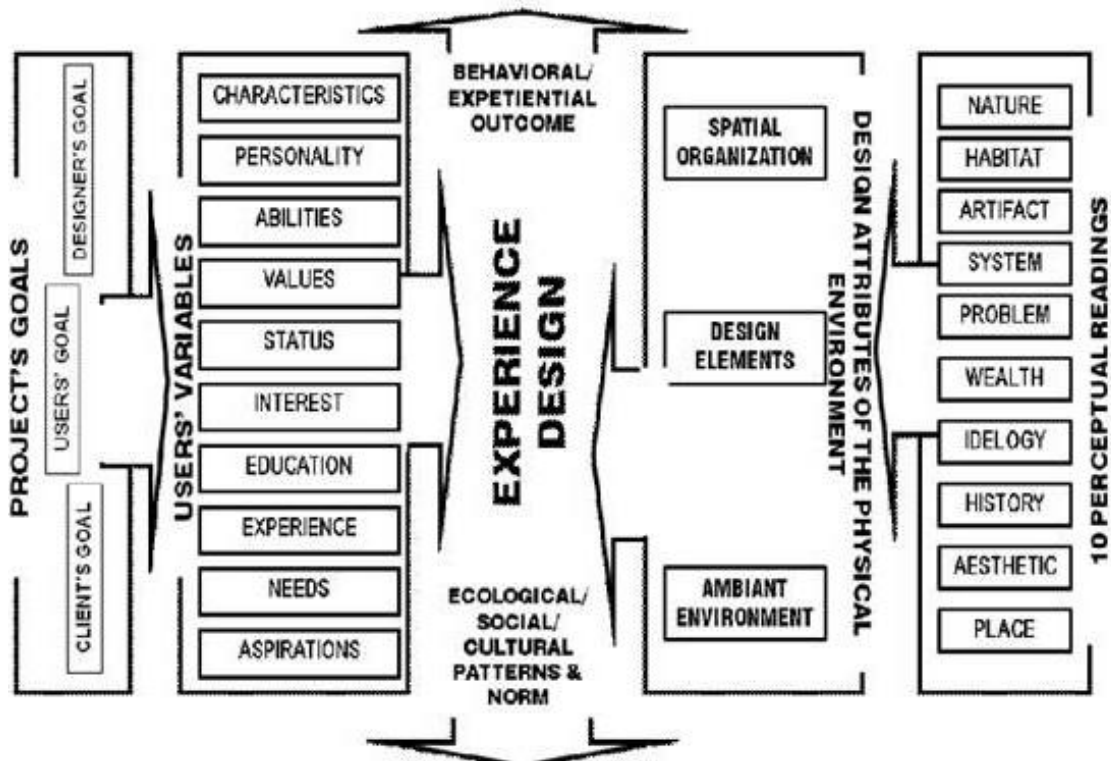


Fig. 5 The Perceptual-Based Design Model (PBDC Model)

As they are adopting the model, students learn to grasp the necessary information from the surrounding environment that enables harmonization of the users' behavior with the systems afforded by this environment. They also identify and design the characteristics of the physical environment that support the potential users' understanding of the environment as well as their participation in and accomplishment of their interactive activities within this environment. The affordance of the environment is thus the directly perceived or recognized constraints of the environment to which individuals are adjusted. In order to ease this process, we suggested possibilities of the ways each of the 10 paths can be operationally defined as a set of required environmental qualities that supports a 'successful' performance of the desired activities of all of users.

The PBDM is thus providing a context within which students are engaged in constructing their own knowledge and where the whole learning process occurs. In this context, students are engaged in configuring an appropriate setting for a pre-described set of activities that are performed over time and place by various users. So, in order for that setting to match with these users' aspirations, needs and perceptions, students bring into play all their existing knowledge and use their preferred tools to create a medium that transform their inferences, findings and deductions into a perfectly designed setting.

Consequently, learners are entitled to choose their proper avenues to decipher this formula and to create settings that transmit greater meanings to a wider population and that give rise to rich, reminiscent designed and non-designed elements for maximum cultural meanings. The framework in this case helps them to develop a design concept based on a deep knowledge and command of the forces that influence design and on a conviction that design is the direct articulation of these forces.

As students are constantly conceiving their scenario of the users' experience in the setting, they have to keep in mind that the every single aspect in their designed setting is a source of information that affects the users' sensorial experience and gives rise to a wide range of feelings and responses which eventually drives all predicted actions.

In order for each path to play its role suitably in the design process, it needs to be identified as a major or minor path and to be positioned in a clear interdependent relationship with the other design paths. To help students understand this relation, we ask them to consider each path as a player in a formation that resembles that of a football game and to place it in the playing field depending on the preset goals of the designer. Suggested formations need thus to be chosen with all perceptual paths available in mind in order to focus on the deficits and the strengths in these paths.

A significant understanding of each path and its transactional relations with the others paths is the answer to this game. This formation is thus essential to implement the designer vision on the ten perceptual paths. The type of formation reflects the expected type and amount of effect that the design can have on its users.

Furthermore, as the setting is defined as an experience of time and space, it is important to keep in mind that these formations are not rigid and that varying tactics should be used all the way through the design process to create a dialogue between the paths that correspond to the varying user's perceived experience of the setting.

The formation can eventually change as the design experience can be perceived through different lenses or from different perspectives. Accordingly, the design elements are suitably organized and categorized according to their roles. However, they coincide and intersect in the person's mind while experiencing the setting in a way that is becomes impractical to discriminate or to disconnect them. Thus, the level of intensity of each incentive can decrease or escalate while navigating and using the setting according to the nature of each human experience and according the sequence and characteristics of each zone used during this experience.

The pedagogical strategy proposed adheres to the 'learning-by-doing' approach described by Schün (1985) as particularly promising for an architectural design studio. Following the old quote of Confucius: *"Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand"* (Confucius circa 450 BC), our learners are practicing how to design and represent their virtual setting by following a modeled framework that focuses on the learner's own effort and experience as the principal mean to gain knowledge. Accordingly, the studio method is based on the exploration and the experimentation processes that lead to a final understanding and representation of learners' own reality. As stated by Tidafi et Al. (08), communication and criticizing of each phase of the learning process, especially the final outcomes are main requisites of this process (Tidafi, et Al. 08).

The studio method is based on two main requisites:

- The identification and the recording of indicators of the project that serve for better understanding, and for future reference;
- The ways learners communicate and criticize the design process and the final outcome throughout the design process.

For a better achievement of these requisites, students learn to incorporate their scope of work, conception and problem-solving proceedings into the theoretical framework without altering that framework. Thus, we have tried to make a relative constancy linking the curriculum with the flexibility that is built into the learning process by creating structured yet flexible learning environment. According to Savery (1994), this flexibility provides enjoyable and more interactive atmosphere for students to enable them detect at their own pace more innovative and established design. In view of that, the learning method consists of a clear guidance and parameters within which students have to construct meaning based on their conceptual understandings, and we would enable each student to set an appropriate plan of action that match her intellectual and technical skills.

The construction of the design knowledge is an important actor of the conceptual design stage. The required process involves defining interested parties' goals, observation, reflection, action plans, experimentation, and implementation. When participating into these activities, learners construct their own and unique understanding of reality and interpret in a way that assimilates all physical, social, cognitive and emotional aspects of learning environment that support student learning.

Learners should make the following decisions ever since the conceptual design stage and throughout the design process: (1) the selection of the appropriate medium used for design exploration by the students; (2) the exploration and the communication of the design process and the plan of action that lead to the final result; (3) the exploration of the necessary design considerations that manifest the design concept properly and accurately.

Since learners are aware of their strength and weakness from the early stage of the design concepts, they are entitled to use any medium during the design understanding, exploration and interpretations process as long as it communicates the designers' ideas properly and as long as it matches with their abilities and the project's goals (Figure 4). The ideation and the communication medium can be one or a combination of manual drawings, mockups and computer visualization.

The evaluation of the learners' performance is based on two issues:

- 1- The type and level of involvement of the learners in the design process and their impact on their cognitive growth. This includes the following sub-issues;
  - The learners' own fashion to formulate a basic concept from their former knowledge;
  - The learners' abilities to analyze and to auto-evaluate their skills and limitations whether in research or in practice.
  - The accurate choice of the appropriate medium to present one's idea in each design phase.
- 2- The resulting design as evaluated according to the resulting quality of feeling and responses of the experience that learners configure via their designs.

The auto-evaluation is one major indicator to guarantee the usefulness and the reliability of this method and to evaluate the position that learners adopt facing the design project in hand, and the means by which they use their acquired knowledge in future. Some of the main assessed issues are the time-limit versus the required tasks, the acquired knowledge versus the needed one, the skills, tools and medium to reduce time and to increase efficiency, the students' feeling and attitudes towards the project its related tasks and above all the impact of the design process on how students perceive themselves and their surroundings.

The main auto-evaluation is made at the beginning of the design process and after the mid-term assessment. Figure 5 shows one of our student's self-evaluation after the mid-term.

#### 4. DISCUSSION AND CONCLUSIONS

The present paper describes a theoretical model for designing authentic indoor and outdoor settings. This model enables the creation of an information processing system, which could be easily applied at different stages of the design, so that learners engage and manage systemically multiple levels of quantitative and qualitative data that presents constraints or requirements in terms of the design process. It also embraces theories related to individual users' transactions with building features and enables designers, whether novice or experienced, to develop their cognitive, sensory, and communicative and mobility abilities. This encourages a personal approach to design problem-solving identification and to converting design-related resources into new or updated products or systems that shape positive and diverse experiences, thus meeting various human needs and requirements.

The authors believe that the implementation of the learning context, as well as the related model initiated and developed in the course of the last five years, has been instructive and informative for both students and instructors. On the one hand, the suggested strategy has a considerable effect on the students' general understanding and manipulation of important yet overlooked factors affecting design decision-making such as environmental communication and building usability. It also

enables students to analyze users' needs meticulously and to interpret their predicted activity in functionally significant settings. On the other hand, as the suggested strategy implies a deep understanding and application of theories of perception and the cultural attributes influencing the design decision-making, it helps students to understand, to accept and to respect design trends regardless of their peculiarity.

The learning outcomes throughout the last few years confirmed for us how the attitude and the conduct of learners with integrity should be and how pedagogues should treat the shallowness and the flexibility of the learners' knowledge. This progressive way of constructing knowledge and external realities using the suggested model has helped learners to abandon the safe and conventional way of thinking to construct a more authentic approach that reflects their personality and shapes their environment.

The 10 perceptual standpoints enable students not only to describe and to auto-evaluate their project objectively, but also to evaluate other projects using the same process. Instead of applying all-purpose design guidelines, dictating other people's know-how, they are engaged in meticulous studies of authentic situations as processed in different people's minds. Thus, they are able to discover, to be in sync with users and their surrounding circumstances and to gain knowledge of their own experience.

Furthermore, the model suggests to students how to communicate beyond the narrow technical and functional cliché of the design elements and to specify the structures and features of these elements according to the "meaning" of what can be seen. Consequently, students not only employ the design elements as items with physical attributes, but also acknowledge the variant meanings of these same elements. At the same time, they draw the meanings together into a consistent body of ideas that shape and add values to the experience of the users.

To conclude, we need to mention that for this learning process to draw the best out of every learner's cognitive potential, pedagogues should be aware of the advancement of three main factors: (1) The impact of the learning process and the selected medium on the learner's intellectual and technical growth; (2) the appropriateness of the selective medium to the learner's cognitive and technical abilities and to the design process; and (3) the level of initiative the learner takes in the design process.

Though pedagogues can control and manipulate the first two factors, the third aspect is a primary determinant for the success or failure of the suggested learning methodology. In fact, the noticeable design outcome has always been that of students characterized by an increased independence and a desire for knowledge and exploration. However, under the current admission system, only a small percentage is enrolled in design colleges with true aspiration in this field of interest and/or with potential for innovation and distinct thinking. In fact, the vast majority are the product of the traditional school education system that is built on recitation and imitation. This category of study can only stand out in traditional design studios, where success and excellence are related to students' abilities to impersonate the style of the teachers and to respect their directives blindly. These students are often challenged intellectually and technically when asked to be self-reliant, to choose their own design approach, to build an innovative design concept and to prepare a plan of action for the design process with the intention of generating an original design outcome. As a result, they adopt a resilient attitude that does not match the time limit of the design studio, and they find themselves unable to work efficiently. It is noticeable there is a higher percentage of this type of student among senior students compared with junior students, who are less resistant and more welcoming of diverse fashion learning.

Therefore, the authors assert that the whole learning environment in our regional schools of design should be restructured for a better and more efficient outcome in terms of knowledge and skills acquisition. This rethinking should include training sessions for pedagogues to allow more positive attitude towards and support of diverse learning styles, and processes regardless of the course curriculums and the orientation of the pedagogues themselves.

To sum up, it is important to mention that the fundamental concept of the perceptual-based design model is not entirely new. Nevertheless, the model, with its well organized variables, and its

students-centered learning process, advocates an improved and more inclusive approach for the design process as well as for the way it can be integrated into contemporary studios.

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