

Design Studios: Approach to Achieve Smart Learning Environment (SLE)

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ABSTRACT

Smart Learning Environment (SLE) is the hourly need to satisfy the urge generated by the new knowledge society. This includes a focus on learning methods to yield a required blend of learning environment that supports experience of effective and engaged learning. The essence of 'SLE' is to create a condition that can enhance the learners' personalized and adaptive learning experience. For the Architecture and Design students, Studio- a physical space that allows students to accomplish their design learning in an innovative and creative manner, plays an integral role in their learning. The main objective of the paper is to redefine the concept of 'Smart Learning Environment' in the context of Design education and suggest a model for the 'Smart Design Studio' based on the perception of learners. The methodology includes surveys and group discussion at the University of Bahrain (UoB), to receive opinions on smart teaching-learning spaces and methods. A short experimental study was done to measure the impact on the design learning as a result of modifications done in the Design Studio. The experiment was centered on the theory of 'Identity Development' and 'Personalization of spaces'. Finally, the paper concludes a new vision on SLE as a learner-centered-environment that allows multiple ways of learning to support all-round development of the learners. As a recommendation, authors suggest a model for the Design Studio to achieve effective, engaged and efficient learning. The key elements of the model are the disseminator and recipient of knowledge, learning methods, modes, tools and resources.

Keywords— Design Studio, Learner-Centered-Environment, Personalization of Space, Smart Learning Environment

I. INTRODUCTION

The design studio is the core of architecture and interior design education. Through the design studio, students learn how to gain the required skills to produce creative and innovative solutions [1]. Students spend most of their time in the design studios- a physical setting, where they receive hands on instructions to perform the design task effectively, efficiently and in an engaging way. They also learn to explore and experiment multiple design theories to improve their levels of understanding and solving the expected design issues. The learning design

studio is a collaborative, blended, project-based framework for training the students in effective way with the use of educational technology. It is effective in developing learners' theoretical knowledge as well as their practical skills, and allows them to link the two. However, it requires a considerable commitment of both learners and tutors.

Smart learning environments assure to provide the learners with right learning when and where they require and support their lifelong learning. A time has come, when design students need to be self-directed and involved in informal learning. New ways of learning are needed that can foster their creative and innovative objectives. Design studios must consider learner's viewpoints and learning experiences. They should have options of selecting what they want at different stages of learning. Hence, a strong effort is required to transform the conventional design studios into smart learning spaces/environment.

The biggest challenge to achieve SLE could be the existing attitude of learning behavior and learning culture. There is a shift needed to reinvent new ways of learning and enforcing new attitude. The other challenge in creating smart environment could be about the technology and its over dependence. Hence, a care can be taken to assure that the smartness of the Design studio is not on account of technology only.

It is imperative to make sure that the students receive an appropriate environment in their learning places i.e. studios, to make maximum learning benefits. In absence of proper care, the place can hinder the creative and constructive learning of the students. Therefore, creating a smart environment that will promote multidirectional interactive learning experience is needed in the studios. This environment should be effective, efficient and engaging.

II. RESEARCH PROBLEM

Everyone is talking about technology playing role in making smart spaces, but how if interactive technology is embedded in the space itself rather than considering technology as different entity and space as different entity. If a connection needs to be established between smart learning environment and the design studio, then a question arises: How can the spaces be treated as an interface for achieving smart learning environment? Is it possible to

reduce the dependence on technology as an added entity and still achieve the smartness in learning spaces?

Based on the above research queries, the authors focused on the following research objectives;

- To study the existing studio culture and studio design practices
- To evaluate and analyze the opinion of students and faculty on their experience in design studios
- To measure the impact of changes in the learning environment on the learning behavior of the students
- To redefine Smart Learning Environment (SLE).
- To suggest a smart design studio model based on the data analysis and existing literature

III. METHODOLOGY

The authors adopted the following methodologies for obtaining objectives of their research;

Literature Review: Different articles and research papers in the field of smart learning environment were reviewed. These articles included: concepts in smart learning environment, design studio culture and practices, learning theories for design education, tangible and intangible issues related to design studios etc.

Students' Survey: A survey was conducted with the participation of 35 students at the Department of Architecture and Interior Design, UoB. The aim of the survey was to study the opinions from the students on their perception towards their studio spaces and design learning process.

Focus Group Discussion: Six (6) faculty from the Department of Architecture and Interior Design from UoB were involved in a group discussion. The aim was to discuss the opinions of the design faculty on their student's learning behavior in design studios.

Experimental study: Short experiment was done with the voluntary participation of 15 graduation level students at UoB. The aim was to observe, if learning enhancement can occur as a result of changes in the physical setting and personalization of spaces for learners in their design studios.

IV. THEORETICAL FRAMEWORK

Smart learning educational environment is defined as the physical environment enriched with context-aware digital devices to enhance learning and generally discussed in terms of smart devices and intelligent technology. To understand the Smart learning environments (SLE), Zhu [2] discusses ten different features of smart learning that mainly include adaptability, natural interaction, high engagement etc. In fact, smart learning system should be able to advice and predict the needs of learners. Discussing on SLE- it

should be effective, efficient and engaging [3]. To create such SLE, there should be a fusion of technology and pedagogy [4]. The pedagogical support of SLE focuses on strategies like conversation, reflection, innovation and self-organization [3]. Smart learning environment should be a self-directed, motivated, adaptive, resource enriched and technology embedded space [2]. Actually, these features get attached with the type of education and the issues arising from there. What is needed in design education are new pedagogical approaches that emphasize constructing knowledge and cognitive enhancement. Smart learning environment is a combination of formal and informal learning that can be achieved through creative and innovative pedagogical approaches.

The adaptation and personalization of physical spaces where the learning will occur is very important aspect of smart learning. The factors that can impact SLE include- learning resources, tools, communities, ways of learning and teaching. These factors are considered to achieve the major objectives of SLE- i.e. to increase opportunities for learning, to foster the knowledge seeking capabilities of learning and to upgrade soft power. [5]

Design is the major subject of architecture and interior design discipline. The learning process of this course is also unique over the other courses in the discipline. To achieve that, students spend long hours in their design studios. Design education is considered as a multi-faceted field due to the complexity of the social and cultural aspect of the users. In other words, the students of design studios need to incorporate multiple aspects of human needs starting from design of built form and ending with fulfilling the socio-cultural, philosophical, psychological, sustainability and technological aspects. Students are trained in the studios to be innovative and creative to successfully fulfil the design problems. Therefore, the design studio must create a learning environment and platform where students will get a chance to develop their imagination power and produce design solution which can fulfil the tangible and intangible aspects of human needs.

A smart learning environment composes of both tangible and intangible elements. The tangible elements include physical entities such as, furniture, resources, tools, walls, floor, ceiling etc. whereas, the intangible includes; light, sound, heating and cooling system etc. in that physical space. Even the list includes consideration to socio-cultural background of the learners etc. [6]

In design studios, the efforts of teaching learning are invested in achieving;

Self-learning: Design students in their studios are trained for voluntary learning behavior. It includes a part where learners learn in the absence of their teachers but with specific objectives, methods and education systems.

Inquiry Learning: Design students perform learning in

groups through discussions and debates. This demands good communication and team skills.

Learning by doing: Design students are assigned activities- which after completion enhance their learning abilities and help construct knowledge.

Learning by working: Design students are trained in professional places to learn through work.

Learning by participation: Design students participate on the making of their own learning environment and this way they are more active learners.

Smart learning in design studios can also be supported by the Chickering and Resisser's [7] theory of Identity Development. Theory refers to the seven vectors for students' development in their learning spaces. Developing competences, managing emotions, moving through autonomy towards interdependence, developing mature interpersonal relations, establishing identity, developing purpose and developing integrity- are those seven vectors which can answer the learning attitude and learning behavior of students at different stages of their learning. How do students feel, think, behave, value, and relate to themselves as well as others can be a key to reach to create the smart learning environment.

The design studio environment is multidimensional. The physical as well as the socio-cultural background of the students shape the tangible and intangible aspects of their spaces. In addition, the environment of studio depends on how the students exercise personalization of their spaces, to engage and tailor experience in their design studios. Actually, personalization is the reflection of a sense of ownership may it be over a space or an object. It reflects a control or ownership over tangible (physical) and intangibles (non-physical) aspects of a space. According to Brower (1976) [8] the physical aspect is noticeable by occupancy, and the non-physical aspect is marked by attachment to the place. Personalization can occur in different ways-like personalization as occupancy, personalization as preference and personalization as experiences [6]

V. ANALYSIS AND DISCUSSION ON DATA

Students' Survey Analysis: The survey questionnaire was framed with 6 questions targeting to receive the responses on smart learning environment from two groups of students: Group 01- students sitting in a design studio (figure 01) with conventional (fit -for -all type) furniture arrangement and group 02- students sitting in a design studio with customized furniture layout to promote group work (figure 02).

During the survey it was revealed that, students sitting in group 01 were not motivated and enthusiastic in their studio and considered the physical layout as the reason

for the same. On the other hand, the students of group 02 were motivated and enthusiastic in their studio and considered the physical layout of the furniture as the reason for the same.



Figure 01: Group 01-students sitting with conventional (fit -for -all type) furniture arrangement



Figure 02: Group 02-Design studio arranged with customized furniture layout

Survey results showed that, most of the students agreed on, technology, space and learners as key role players in creating the smart learning environment. They believed that, the attachment of the space would grow when they would be given the opportunity to participate in organizing the space for themselves. They voted positively for personalizing their spaces and expressed that, it would add to their learning. When they were asked to give their opinion on the ways to personalize the spaces, majority said the need to have changes in the conventional furniture layout to improve the 'student to student' contact and 'student to teacher' contact respect to their physical and visual values. They suggested bringing accessories to personalize their spaces. Other suggestions included: having spaces for hanging their design progress work, painting their studio walls with their favorite colors/patterns and having individual workstations with coffee corner and prayer spaces. Students partially agreed that, technology can be kept aside and still smart learning environment can be achieved.

Smart learning environment was defined by them as, 'the environment which gives scope for effective learning through participation, interaction and collaboration'. According to them, the environment should provide smart devices, advance technology along with different learning ideas. It should reserve a scope for 'teacher to student' communication to make the learning at

ease with flexible environment. It should value tangible and intangible aspects of design studio environment.

Focus group discussion with faculty: A focus group of six (6) design faculty from Department of Architecture and Interior Design was formed to discuss their opinions on current studio-culture practiced by their design students and the remedial measures to foster smart learning environment. Here the studio culture refers to the students' behavior, their communication and collaboration in design studios. Following were highlights of the discussion;

- In the current situation, all faculty showed concern about student's passive behavior, low participation, less creative output and lack of peer interaction in design studios. They talked about students' tendency of leaving their studios before time and preferring to complete their work at home in their comfortable zones. This hampers the core idea of studio culture which expects the students to stay long hours in studios working with peers under the support of the teacher's feedback. According to them, student's behavior is not aligned with the true definition of design studio-culture where students are expected to stay long hours and produce creative work with the interaction and feedback from peers and teachers.
- They emphasized on the need for interaction among the learners and their physical, social, cultural and virtual environment to enhance learning.
- They expressed that, smart learning environment carries physical context (content, resources, technical and learning methods) as well as social context (learning community). Both of these are integral parts of learning scenario.
- Some said, SLE to be high-level digital environment, where as some agreed that SLE is a support to achieve efficient, engaged and effective learning.
- They also talked about the practice of using smart devices in the studios for improving teaching, learning and feedback.

VI. EXPERIMENTAL STUDY

A short experimental study was conducted with the voluntary participation of Graduation design students. The objective was to observe the impact of changes in physical setting and students' participation in personalization of spaces on their learning.

Participants: Fifteen (15) students from graduation level of Interior Design Program participated in the experiment at University of Bahrain. They were in the final level of their design courses and had continuously

been expressing their dissatisfaction in studio environment. Students were expected to spend long hours in their studios, but authors observed that, the conventional studio environment could not motivate them to stay longer and produce creative output in their studio spaces.

Steps taken: The experiment started by responding to the students' recommendations for improving their studio environment. For the same, the furniture layout of the studio was modified to create the individual work/study corners for students with their own participation, so that they could express their genuine needs. The new arrangement kept a high scope for grouping of students as and when they needed to allow peer interaction. Face to face sitting enhanced their mutual exchange of ideas and allowed discussions. To personalize the spaces, students brought items and accessories like their art works, favorite books, coffee mugs, family photo frames, stickers, sticky notes etc. Some display boards were added for hanging their design progress work. They were allowed to scribble on whiteboard to freely express their ideas. They also created a coffee-club by setting up a small tea/coffee corner for enjoying their breaks in the studio (figure 03).

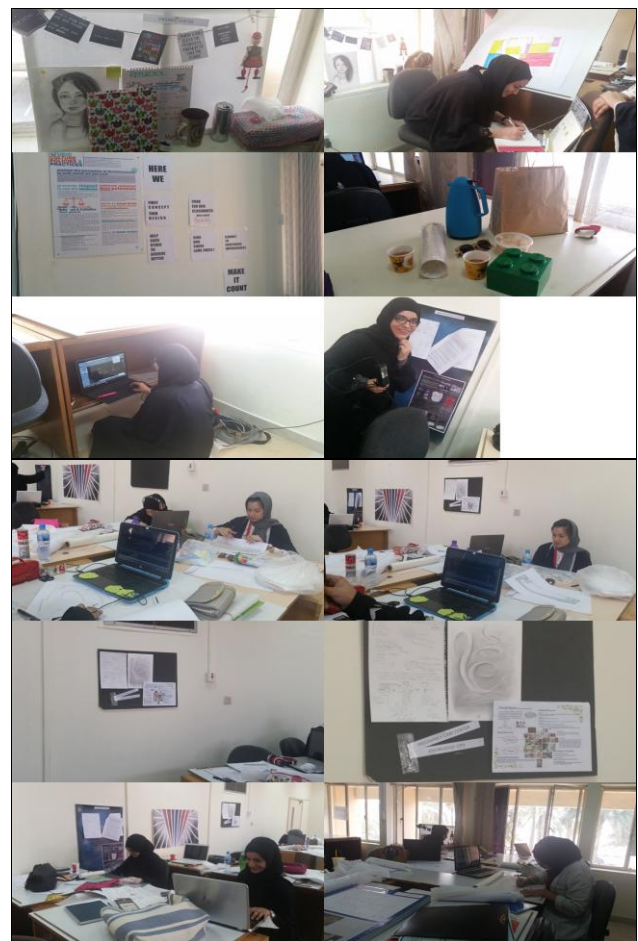


Figure 03: Images showing personalization of studio spaces

In addition to the above tangible aspects, a focus was also given on intangible aspects. Window shades were rolled up to receive enough daylight in studio. Windows in good weather condition were kept open to receive cool breezes. Indoor air temperature was maintained to comfort the needs of the students. Achieving appropriate acoustic level was not an issue, since the studio was already located on first floor level away from the unwanted noise generated by the gathering spaces on the ground level. In addition, students were permitted to play music with low volume.

Students requested the faculty to provide them with high speed internet service as well as a colored printer to print their progress works within the studio. Since it was not possible to get the official approval in short time, students took up the responsibility to share the expenses on their own as a team to buy the printer and portable modem for internet services.

After making changes in studio layout and intangible environment, authors as faculty also invested in the application of various pedagogical approaches. Some of these included, peer learning, peer feedback (direct and indirect), self-assessment and peer-assessment along with faculty assessment (figure 04). Peer learning took place where peers supported each other through Peer-assisted learning activities. Through peer feedback, students offered critiques to each other on their design progress. The one who received feedback improved his/her learning and the one who gave feedback improved his/her confidence on leaning. When direct feedback was becoming a conscious activity and was not gaining the real benefit, it was switched to anonymous critiques so that, the peers could freely express their observations and comments for their peers' improvement. Self-evaluation and peer evaluation also proved to be useful tools in the learning process where students could learn to figure out their weaknesses and strengths using the rubrics and criteria of grading their peers' work or their own work.



Figure 04: Images showing studio learning activities

Observations: Hourly-Time-Analysis-Activity was conducted for four weeks to observe students' interaction with their environment. Some of the observations are enlisted below;

- Frequency to leave the studio for breaks was reduced, rather students preferred to enjoy breaks within their design studio.
- The usual urge to leave the studio early to complete their design assignment at home also reduced and they started staying long hours in the studios.
- They showed immense enthusiasm to personalize their spaces and were satisfied on their space belongingness.
- Students started sharing their ideas, feedback and even stationery items and enhanced collaboration with their peers.
- They actively participated in different learning activities conducted by the faculty.

Inferences: The following inferences were drawn from the above observations;

- Students could stay long hours in studios as the environment favored their needs.
- Physical layout of the furniture helped the learning process by improving easy access to their peers and teachers.
- Students could improve peer relationships that can affect their learning from each other
- Studio culture could be seen taking shape in the design studio revealed through long hours of work in studios, multiple learning activities, students' satisfaction in their workspaces etc.
- Studios became smart learning environment with the introduction of appropriate tangible and intangible elements to kept the students actively and efficiently engaged in their learning.

Limitations: The experiment faced the following limitations;

- Experiment was performed with fifteen (15) students only which is a small number of participants to generalize the observations.
- This design studio was also used by different set of students for other non-design courses, so it was difficult to maintain the settings of the personalized spaces unchanged for long time.

- Observations were recorded for four weeks and eight times only, which maybe a short time to confirm the inferences.

Benefits: Students improved learning through the enhanced collaboration of student-student and student-teacher contact. It should be noted that, the learning environment provided learners with feedback from peers and teachers during their problem-solving stages and hence can be considered as smart learning environment [9]

Studio environment was appreciated as smart learning environment because it offered the learners an opportunity to create their own learning spaces by adding the required tangible and intangible aspects to it. The environment helped them to construct knowledge. With the changes in physical setting and the pedagogical approach, it was possible to achieve the true objectives of SLE. The study identified that, allowing students to personalize spaces offered the faculty an ability to recognize and respond to the emotional states of the students during their leaning and thereby, provide them the required motivational support. This itself is an important characteristic of smart learning environment [10]

VII. CONCLUSION

To achieve a successful learning model, it is essential to allow students and teachers to personalize their learning spaces. Adding some personal touches can bring a positive change in the learning behavior of the students. The students should get the feel that, they are the owner of their spaces and can take charge of it. They should be empowered to change their spaces as per their needs; this means the physical parts of the space should be kept flexible for allowing the required changes [11]. Customization of learners’ spaces and delivering them the control of those spaces adds greatly to their learning. Design studios can be converted into dedicated workspaces by bringing the required changes in the interior environment. Such changes indicate to students that, they should be externalizing their ideas and working individually and collaboratively whenever possible. This also enhances the student teacher interaction along with the peer interaction.

‘Identity Development’ theory by Chickering and Reisser [7] through its seven vectors for students’ development in their learning spaces can support how the changes in the physical setting impact the learning behavior of the students (figure 05). Students development during their learning stages is highly affected by the surrounding spaces and people as well as the identity and intimacy they produce among them.

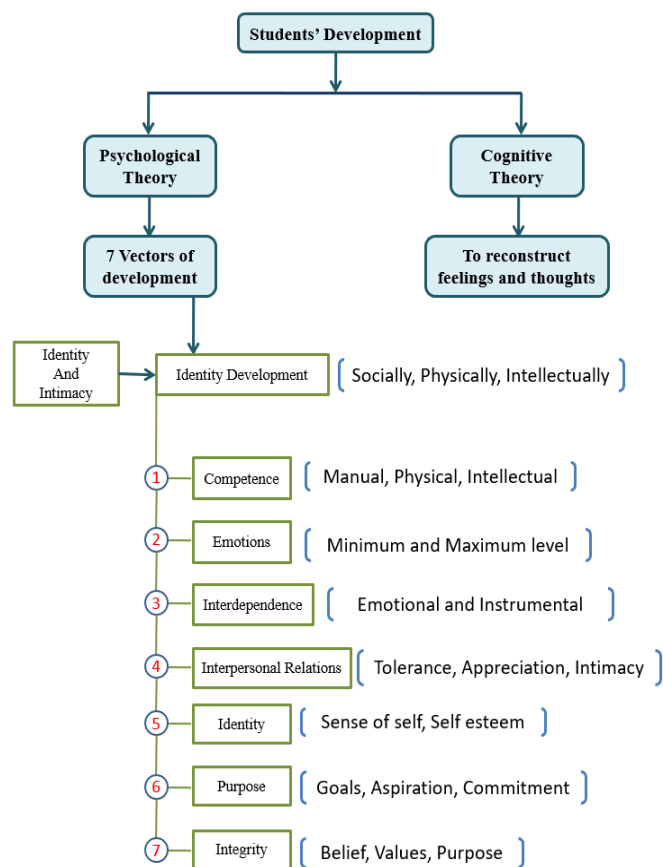


Figure 05: Seven vectors for students’ development in their learning spaces

To achieve personalization in smart educational and learning environment, participation of the learners is very necessary along with the emphasis on the implementation of new pedagogical approaches. The different levels of pedagogical approaches should support conversation, reflection, innovation and self-organization among the learners. Transforming the process of teaching and learning involves role of teachers to create different learning environment that will promote interactivity [12]. In studio spaces, the design teachers can make this happen through the changes in physical settings -its tangible and intangible aspects, to improve interactivity among students and teachers. Personalized and adaptive characters of studios can make possible self-learning, inquiry learning and learning by doing by the learners. The following figure 06 can explain the learning in studios.

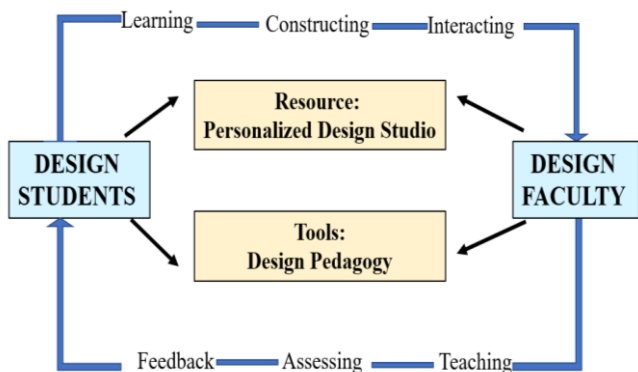


Figure 06: Relationship among the elements of learning

A learning environment or educational technology can be considered smart if it is effective, efficient and engaging [4]. Therefore, the notion of the environment should include the design and development of that environment, how it engages the learners, and the extent to which it is effective and efficient.

In a studio for design students, smart learning is associated with 3 elements: students following a studio-culture practice, faculty practicing the appropriate pedagogy of knowledge construction and the environment that supports it to happen. If so then the question of having advanced technology does not seem to be crucial to make it smart because the aim of SLE is to increase the opportunity to learn to improve the learning quality through efficient, effective and engaging environment which can be achieved without any strong emphasis on technology.

Results from student survey, faculty group discussion and the experimental study performed assist the authors to conclude that, allowing students to define their personal spaces motivated them to stay longer in studios and perform better learning. Improved physical setting of studios with efficient furniture layout and proper consideration to tangible and intangible aspects of the space, helped learners to adapt to different learning styles and learning abilities, provide support to their lifelong learning and development. This itself can be a way of redefining the Smart Learning Environment.

In some cases, learning environments can be seen as smart only in relation to specific individual learners, because every learner’s environment differs from each other. But in the bigger picture, the smart learning environments are the spaces that provide the highest opportunities for people to connect, engage, support, and challenge one another to learn better [13]. The figure 07 shows the framework of smart learning environments based on personalization of space and use of multiple pedagogical approaches.

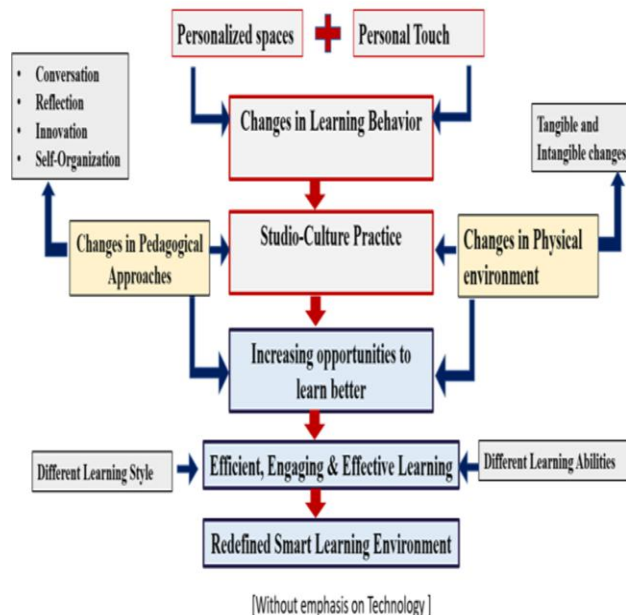


Figure 7: Framework of Redefinition for Smart Learning Environment

VIII. RECOMMENDATION

After studying the important aspects of design studio spaces and education, authors have proposed a model (Figure 08) for the Smart Learning Environment for the design studios. This model considers four key elements: faculty, students, teaching-learning methods, tools and resources. TRACE functional model of smart learning environment is kept as reference to derive the model. The model shows participants, process and the environment as essential parts to achieve the smart learning in studios [14].

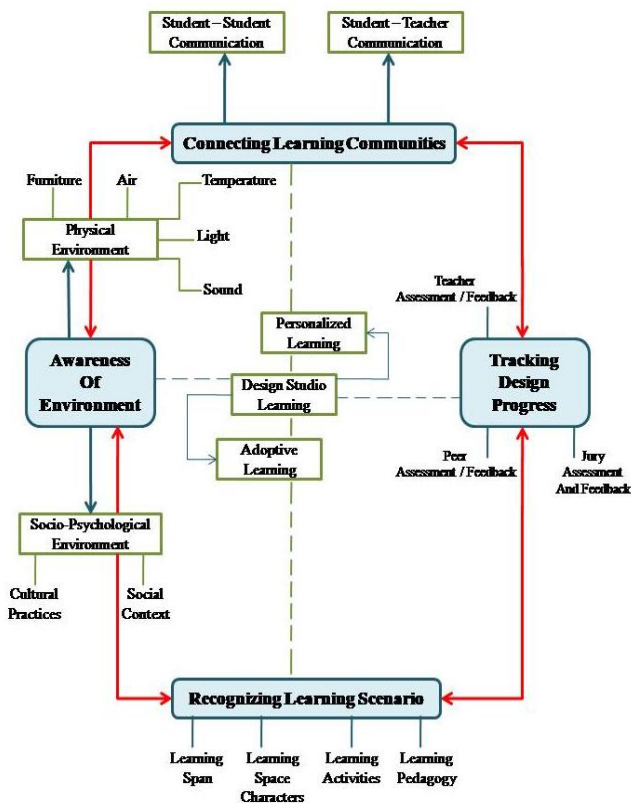


Figure 08: Recommended Model for Smart Learning Environment in Design Studios

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