

Design Education through Facilitating Student-Centred Learning

Harsha Munasinghe*

*School of Architectural Studies, George Brown College, Toronto, Canada

***Corresponding author:** Harsha Munasinghe, School of Architectural Studies, George Brown College, Toronto, Canada,
E-mail: humansinghe@georgebrown.ca

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Abstract

Student disengagement in the architecture design studio is our research-focus. Design teachers complain that their multitasking students are not interested in learning, whereas the industry complains that the products of design schools fall short of their expectations. Having observed student disengagement in design studio as a cause for this schism, we tested ways to bring students back to learn-through-application. Among the reasons for their demotivation, we found, is the gradual drifting of design studio pedagogy towards stereotyping, moulding students to design a final product rather than inspiring them to fine-tune a design process. Our hypothesis is that if the design studio includes its participants in the learning process, their engagement in the studio can be improved. We tested various methods of improving the design studio pedagogy, the most tested pedagogical tool in architecture school by providing an open forum for knowledge-construction and dissemination. Our major breakthrough came when the students were made to feel that they were included in shaping their learning exercises. Our quest is to test the strength of such learner-centred design studio, in which responsibilities to knowledge-construction and dissemination could be shared. Our qualitative research methods included observation and participatory observation of design studios and depth-interviews of teachers and students at several schools. We also conducted experimental design studios to test the hypothesis of collaborative studio, and found that more we include the students and more they learn.

Key Words: Design-pedagogy; Design-studio; knowledge-construction; Learner-centred-teaching

Introduction

We have observed a striking disconnect between graduates and products expected by the industry in the design field. Data collected from design schools and industry experts show that this gap is widening, mostly due to students' disinterest in constructing new design knowledge and authentic solutions [1]. Among the major reasons is their disengagement in the learning process and its major pedagogical tool, the design studio. Students seem to get demotivated with this authority-focused learning that has been planned without paying due attention to them [2&3]. We focused on educators' role in motivating student participation in order to bridge the aforementioned gap. Many educators seem to expect an increased student engagement by integrating technology and the boundless cyber space to diversify learning opportunities. However, our data suggests that the use of cyber space has made them more passive learners and mere solution-surfers. We also found that this disengagement is alarmingly escalating as students advance through their academic levels, suggesting more they know more they are demotivated [4]. This growth of demotivation within

an academic program suggests that our way of teaching that hardly integrate our students in learning is equally responsible. How should we redefine our roles in design studio to improve student engagement in learning? Many scholars have collected data on design studio and have suggested various approaches to change the learning styles of design studios [5&6].

Active learning, which is essential in knowledge-construction, is strongly associated with the cognitive repertoire of the learner [7]. Today's learning space provides more possibilities for such cognitive repertoire in an unparalleled scale and an unprecedented pace. It is essential to understand students' way of using cyber space in order to provide guidance to use it more profitably. Our pursuit is to scrutinize how educators could ensure that their learners are encouraged to continue in knowledge-construction rather than surfing the net for answers. In the traditional role of teachers as knowledge-tellers, we seem to be doing most of the work, restricting our students' contributions to more like, 'filling the blanks with a suitable word to complete the sentence' assignments. They are evaluated by using a pre-designed fixed marking rubric

that has not integrated student's background or learning styles, but the teacher's. The students are given a correct answer in the name of feedback without encouraging them to realize their mistakes. It is needless to say that most of our feedback does not facilitate continuous learning. This teacher-dominated nature of the design studio has caused the degrading student-engagement. By following such a conventional teaching practice to make them our minions, we have practically driven away our learners.

Design education, which aims at producing specialist professionals, is a cultural activity just like any other education [8]. It shall aim at constructing design knowledge thus helping students to evolve a design process that they may fine-tune through continuous practice and application. Design studio is the most time-tested pedagogical tools used for knowledge-construction through cognitive repertoire. The studio run by practicing architects provides the participating students with opportunities to practice and apply their constructed knowledge too. Students noted that the design studios with real-world clients encouraged their engagement and knowledge-growth more compared to hypothetical assignments. Yet, we found that some design studios had been stereotyped and their guidance towards knowledge-construction had been curtailed within teacher's experience and/or by pre-planned learning outcomes of the school curricular. Those studios, which were strictly controlled by a dominating teacher or a school of thought, were mere cloning factories that obviously failed to motivate student learning. We observed a striking rate of student disengagement in studios that had not represented the socio-cultural background of the student. The disengagement was much higher when the disparity within the student population was higher. Students felt that their learning was similar to a guild-training that hardly demands innovations.

This directed us to test a way of reforming the design studio by reinterpreting it to be more user-inclusive. Having noted the strength of learner-centred teaching, we made attempts to reinterpret teacher's role as a facilitator in design studio. We encouraged teachers to share responsibilities with the participating students in planning such modified design studios. Our immediate attention was the development of a design brief and then formulating a marking rubric with the involvement of students. We organized a couple of experimental studios, in which the students were heavily involved in making the both, brief and rubric within a set of broad guidelines. The brief formulation was treated as a significant component of design development and the rubric heavily assessed their engagement rather than the end-product or its presentation. Furthermore, we replaced the dominating role of a studio teacher with that of a guide. Students confessed to better engagement, learning and producing more authentic designs of their own.

Our qualitative research methods included observation and participatory observation of design studio as well as depth-interviews of students, teachers and industry partners to collect and analyse data. We also arranged a few design studios to test our hypothetical tools of collaborative studio to integrate students in the learning process [9]. This paper is based on our learning through this research project.

Design Knowledge Development

Design as a creative problem-solving exercise, and design education is teaching students to develop a rigorous approach to solve such a defined design problem. As such, design education shall include the interpretation of a design problem and conjecturing a solution through critical thinking and testing. The design studio provides the best space to complete this process. The preliminary solution is more like an unpolished precious stone and the continuous engagement of the designer with a defined problem and continuous growth of design knowledge; defining and redefining it along with surfacing resources may finally polish it off. For example, a space we design for a client may start with client's needs yet within the socio-cultural context in which s/he intends to use that space. Resources and technologies to build it and its acceptability to the society and users would fine-tune its final form. Students will have to enhance their design knowledge to provide the best solution in today's context without sacrificing client's needs [10]. Each designer should be trained to develop a unique approach to define a design problem, to formulate a solution, and then to fine-tune solutions, thus making his/ her solutions creative and authentic. This means that the design process starts with the problem-identification. Design schools have a responsibility to provide education so that each student would develop his/ her own creative problem-solving approach devoid of their personal biases or teachers' preferences. The student should be urged to argue why this particular solution is required and how it could be successful in that particular context. A design process undoubtedly is a cyclic one, in which the problem-solver constructs knowledge through reflections and rationalizing his/ her decisions. The overall aim of design schools, which we focused, is providing a design education so that the students are able to shape up a design process. Their aims to move away from schools of thought ideology should be appreciated as an attempt to produce creative designers. We tested their design studios to see how this aim has been pegged down through learning outcomes of design studios at different academic levels.

Recent research on brain development sheds light in framing design education for the current student population. The unprecedented speed of data transformation and the boundlessness of knowledge transfer place the current student population in a highly-diverse context [11]. Today's multitaskers seem to believe that data that drifts in cyber space as knowledge and solutions, and therefore it is not essential to construct or retain knowledge. The discontinuity of knowledge-construction, retaining and retesting the constructed knowledge could be mostly credited to the socio-cultural context of today's student. Their school education was authority-focused and heavily dependent on information-feeding. The design schools are challenged to continuously change their learning outcomes to engage this new breed of students. The failure could result in producing graduates without sufficient knowledge to meet the requirements of the industry or graduates who are unable to meet the requirements of their future clients. Our primary data shows that schools recognize presentation techniques and software as a way of responding to industry demands, misunderstanding that the industry is looking for a cad-monkey. It is a fact that most schools assign at least 10% of their marking rubrics for oral and graphic presentation of the final product. Therefore, students spend time looking for answers and developing presentation skills. Most unfortunately, they have been pushed towards spending most

of their time learning software programs than designing [12].

Following the understanding of learning as a change in neuron-networks of the brain [13], we conclude that these misconceptions; data as knowledge as well as intention of producing for the industry, are among the major reasons for students' disengagement in design studio. The educators seem to have misunderstood students' rendezvous in cyber space as a way of motivating their learning. The popular motto of using technology has only aggravated their lack of engagement and disinterest in group work that leads to knowledge-construction. We have documented how naïve the students are in terms of using such technologies or tools in serious learning assignments, but for short-cuts to find answers. Our primary research has also surfaced that many of them are not such tech savvy, and not able to use the internet for knowledge-construction. Hence, mere integration of technology for the sake of luring students back to the studio has not helped their learning, but rather pushed them to more isolations and disengagement. The primary aim of design education shall not be training the students to find answers but guiding them to develop a design process. Moreover, the devised evaluation tools should assess their continuous knowledge-construction and not only the final product and its presentation. It is important to note that excelling a design process would eventually help them to produce creative final products. We seem to have failed in developing creative ways of teaching students how to be creative!

Cognitive neuroscientists have established how brain neurons would grow new cellular material once the brain is engaged [14]. This is why we conventionally say that learning results in the growth of brain. More importantly, it has been established that the brain would reabsorb those new cellular and conserve its resources, if they are not reutilized. This means that continuous application of knowledge is essential to complete this growth-function of the brain. In other words, an assignment that does not urge students to construct new knowledge and does not provide the students with opportunities to apply their new knowledge is incomplete. Following the arguments of those who promote the concept of andragogy, design assignments could become a complete learning process if it includes formative assessment at every step [15]. Our failure to develop apt learning goals would only demotivate students. The design education shall emphasize on inspiring students to develop a design process to create an authentic end-product. Yet, most popular education system places more weight on the final product; a house, an institutional building or an industrial building, etc. rather than the process how those designs were realized. Then we assess its style, buildability, appearance, and the trendiest ecological issues. We inadvertently push our students towards stereo-typed solutions, and they do not find any reasons to engage in learning as the design studio exercises do not help the student fine-tuning an authentic design process to create matchless solutions. We seem to have found our comfort zone in terms of telling our students how to make a known-product rather than inspiring them to develop a design process. The design education has to motivate continuous engagement in knowledge-construction in order to trigger brain development towards creating authentic solutions.

A student, who has been following teacher-oriented learning for twelve or more years in a school, easily finds his/ her comfort

zone in our authority-focused educational mode. Also, such a student will easily pick the teacher's way of grading in order to get a higher grade. It is also important to note that today's learners often demand that the quantity of their work and the time they spent on them should be appreciated by teachers rather than the quality of work produced. This seems to have worsened the cloning process that produces mere exam passers, who fall short in meeting the requirements of their potential employers. The current learners seem to represent a social-cluster that does not intend to engage socially either, and their real-world experiences are somewhat restricted to social media. Many of us as educators seem to have considered that if we give so-called technology-based assignments, in which our students have to use the internet or the smart phone, we could engage them. Yet, we seem to have failed in their pursuit of knowledge, but reinforced their idea that the internet as the ultimate source of knowledge. It is rather imperative that design education addresses this issue of student-disengagement by revitalizing the design studio to fit this new brand of learners.

Design studio, the most tested teaching tool used in design schools, has evolved significantly from enculturation to learning. It is not anymore, a novice following the footsteps of a master in order to learn master's way of making decisions. Many schools have reinvigorated the design studios to question the existing decision-making patterns thus providing more openings to grow students' critical thinking abilities. This long journey of revitalization of design studio should be acknowledged in strengthening its role to accommodate the learners of information age. Design studio is still the most valid teaching tool, but the teacher may have to become a facilitator to strengthen and widen student's participation in learning. Our hypothesis is collaborative design studio that motivates students to do more in order to improve knowledge-construction and retention.

Design Studio as an activated learning space

Our primary data shows that a design studio that provides students with rigid topics, strict design briefs, and space requirements does not encourage their engagement. Students also felt that such studios were more authority focused and their underlying structure is dominated by the teacher. Furthermore, its potential of guiding the development of skills in rigorous design decision making is fairly limited. We have assessed different learning objectives of design studios to test how the role of the teacher has impacted student- engagement [16]. Our misconception that the students of lower academic levels; up to the third semester, should be given all those details seem to have moulded their decision making to fit the thinking of the studio-teacher. It becomes extremely difficult to then change their expectations from the teachers. Those free thinkers who came to our school leave as a brainwashed and teacher-dependent robot. We seem to have curtailed their thinking and derailed their development as critical thinkers. It is important to understand that all our students have their own creative skills when they join design schools. Our duty starts with identifying those individual skills in order to facilitate their growth.

The design schools heavily-use the design studio as the major pedagogical tool. The schools, where we conducted our study, require their students to earn at least 50% of their academic credits through studio assignments. Some schools have evolved

their theory classes to support studio assignments. They all have set formulae for studios at each academic level, along with learning outcomes to scaffold up design education. However, we noted that the involvement of the teacher is significantly weighty in planning most studios. The teacher selects projects after doing various in-depth studies yet within the guidelines of the school, prepares a design brief and determines space requirements in order to provide the students with an assignment that can be completed within a given time. These steps followed by the teacher are necessarily governed by the learning outcomes set by the school curricular for the particular academic level. It is needless to say that the teachers hardly respond to the needs of the learners. The teacher may change studio projects yearly by switching the context or by changing the client, yet without changing the topic or learning outcomes. Some of those learning outcomes have not been changed for decades, even though the students, their contexts and their learning styles have evidently changed. As this stagnant learning space makes students outsiders of the learning activity, we agree with Doyle, who notes, "It is the one who does the work who does learning" [17]. Our conventional practices make sure that the teacher learns more than the student, and the teacher may get more motivated than students. It is imperative to reverse the involvement of teacher and student in the design studio, thus sharing the responsibility of its planning.

We seem to have forgotten that the inherent quality of design studio, as a teaching tool, is being open-ended as its aim is guiding the students to develop a design process and not a product. It is a forum that could facilitate a continuous exchange of ideas, theories, experiences, concepts, as well as knowledge. Some design teachers seem to believe that the students are taking their studios to learn how they design whereas some schools seem to believe that their graduates should represent a certain style to represent their alma-mater. The feedback provided to students is often dead-ended, in which students' final products are compared with what the teacher or the visiting critiques would have produced. This closed-types feedback does not encourage students to continue their learning, and as such completely ignore the strengths of this pedagogical tool. The design briefs used by those teachers seem to demand meeting several external constraints, crippling the activity of learning [18&19]. Furthermore, as Goldschmidt et al. note most of such stereotyped design studios seem to imitate workplace practices of professional designers in terms of materials and representations, thus losing the inherent quality of design studio as an open-minded learning space [20]. Considering the fact that knowledge-construction of each student is uniquely framed by his/her socio-cultural background, it is easier to understand why pre-planned design studios demotivate students by becoming human-melting-pots.

Some teachers also confessed to getting demotivated with those repetitive design exercises, promoted by the school curricular, over the years. They found that they were drifting towards teaching by practice without making any serious attempts to knowledge-construction or facilitating a continuous dialogue with the student. We also interviewed some visiting faculty who stopped teaching after their attempts to infuse new methods were thwarted by school administration. This shows how studio teaching has demotivated teachers thus failing serve its very purpose of constructing and/ or disseminating design knowledge.

Our collaborative studios made a few deliberate attempts to increase the workload of students by giving only a broad topic thus urging students to research and develop a design brief, find space requirements and space articulation. We encouraged them to start with site analysis and internal zoning rather than typical bubble diagrams to represent various spaces and their relationships. Our aim was to see how this could instigate their motivation towards learning. The inclusion of brief development as a part of the exercise to enhance students' involvement in decision making was first questioned by the students, whether they would be given grades for such activities. Having understood the mind-sets of current students, this had been accommodated in the marking rubric, and they were made to understand how a comprehensive brief could lead to a good final product. The teachers could guide students to develop a workable brief by providing open-ended feedback, various research sources, and useable references continuously. Those experimental projects had client/ user representatives, with whom the students could discuss clients' needs to prepare a more fitting design brief with a sketchy pathway to meet those needs. The students were asked to inform the teachers what they expected to learn from the particular exercise, and the studio teachers were asked to help students align their expected learning goals with the learning outcomes of the curricular. We urged students to start with a feasibility investigation of the project and students had to first argue for the need of the project at that particular context. The students were encouraged to work in smaller groups, with or without a design tutor. This exercise, by promoting their ownership of the design studio, engaged them significantly. The teachers continuously checked their progress to make sure that their learning was not inconsistent with the aims set by the school. These group-works yielded more enthusiasm and participation as they had no hesitations in expressing their ideas and as they felt that they were given a more responsible role.

This sharing responsibility was assessed periodically, bringing success in terms of student engagement as well as teacher satisfaction. The students started claiming ownership for their solutions, even though our priority was not placed on assessing their end products but the process of learning. However, this initiative was challenged by some teachers, who felt that they had no role to play and the students were not provided with sufficient guidance to produce a tangible final project. Many teachers also doubted if the students were capable of developing a proper design brief, and as such their final product may not be practical. Moreover, their worry was how to assess a student who may argue that the project was not viable and decide not to produce a final product. Our dialogue with teachers and students, requiring each student to produce a design solution to complete the assignment by making it viable within the particular context, managed to clear such doubts to a considerable extent. This exercise was well-received by students and they were happy to note that sharing ownership helped them learn more.

In transforming the design studio into a learner-centred pedagogical setting, where the process of design was taught and assessed, we tested how student engagement involves knowledge-construction and creative thinking [21]. It is vital to understand the socio-cultural background of students before planning how to inspire their creativity [22]. The generation gap between teachers and students was clearly reflected in the teaching and

learning styles as well as the goals set by these two participating categories. However, teachers and students could come to a better understanding after realizing whose learning was more important. This understanding resulted in the decision making with regards to sharing workloads and developing a continuous dialogue between them. Our continuous dialogue with teachers during the design studio surfaced more important clues to further sharpen such student-oriented design studios.

We managed to draw two conclusions from our data; first this novel approach was not within the comfort zone of students and teachers, and then second it requires further investigation if we were to use it in design schools. Naturally, we started looking at the works of various educationists and post-secondary teachers to see if this could be further developed similar to an inquiry-based approach to teach design [23]. Our test runs revealed the possible success we could achieve by making the design studios more learner-centred, and depth interviews with students and teachers attested to their gained design knowledge. The shared ownership of the design studio did motivate students and encourage their engagement thus showing glimpses of hope in knowledge-construction.

Facilitating student-oriented design education

Many scholars have discussed the strength of student-oriented teaching in many other fields [24&25]. Maria Montessori noted that the greatest sign of success for a teacher is being able to say, "The students are now working as if I did not exist" [26]. We witnessed a similar situation during group works in our experimental design studio. This was a situation where the students' neuron networks getting activated more than the teacher's, though it did not make the teacher a total outsider. In fact, student-oriented teaching demands teachers' involvement more at the planning stage. In other words, student-oriented design studio does not reduce the workload of teachers, but the students do not feel their dominance in decision making. The teachers will have to conduct research to provide resources that would be further investigated by students, either individually or in groups, in order to share the ownership of the design studio. The teacher should understand the importance of developing more innovative assessments; formative as well as summative, to evaluate each and every step of the learning process. Our attempts to introduce such continuous assessment to design studio brought success in terms of student engagement and their learning [27]. The students spent more time in those design studios and worked with their peers, discussing their decision making. We could notice the growth of their critical thinking as they were not uncomfortable with critiques provided by their peers or making self-criticisms during group works. Moreover, the students were not hesitant to reflect on their own work and continue their investigations. The students confessed that their learning was more consistent and that they felt confident in their design solutions.

The positive development of educators as facilitators from what we had already heard as active learning, guides the teachers to practice active learning through planning different activities [28]. By playing the role of a facilitator, the teacher could involve students even further by encouraging each learner to do their part to their best thinking. As a facilitator, the teacher could encourage learners to search for integrated and authentic solutions that are contextually-sustainable. A teacher should be an expert in the

particular field to facilitate learning in a design studio, and an open-minded individual who is keen on his/ her intellectual growth. Planning such activities without imposing his/ her knowledge on the learner is challenging, and the teacher should be able to take that challenge. These activities should be open-ended and should not be restricted by teacher's pre-conceived ideas or the school curricular. We, by adding research articles without providing any interpretations and by showing precedent studies of similar design assignments without giving opinions, made attempts to inspire students' thinking. In addition, guidelines were framed so that students could formulate questions, or raise issues, or a prepare line of reasoning to be discussed and reviewed at the studio. We found successful results by directing students to experience and review similar built spaces. They enjoyed meeting and interviewing practicing designers and various other professionals. At the end, each student was asked to reflect on his/ her engagement and learning.

Our intention was to promote active participation of students in the learning process while limiting our role to be more like a participatory observer. Those attempts encouraged student active participation. They attested to enjoying the new roles assigned to them. Their reflections showed the marked growth in enthusiasm and participation. At the same time, some teachers participated in our design studios did criticize the end products as incomplete as the students spent more time talking than designing. Their criticisms may have sprung out from their inexperience in the new role as a participatory observer or losing their traditional role of a total controller. However, those criticisms were encouragements to fine-tune our process of planning student-centred design studios, which placed priorities with the fine-tuning of a design process and not with a final product.

A design studio, in which the teacher becomes a facilitator, should start with a well-detailed study plan. It is imperative to formulate learning outcomes with a thorough knowledge of the learner. This is why we inquired the students what their expected learning outcomes were before fine-tuning the learning outcomes of the studio. A teacher does not have to share his/ her learning outcomes with the student but a grading rubric that reflects those outcomes. The study plan should not be too rigid but flexible enough to be objective-oriented and to be adjusted to accommodate the learners' exiting knowledge and learning styles. These learning outcomes should also reflect who would be doing the learning; when the learning starts and when it is completed, what would a student know after completing the studio, and how would the teacher know that the student has completed the learning. We should always be ready to adjust these outcomes and their realization as the design studio progressed. It must be stressed that a design studio that uses a residential house as a case does not necessarily teach how to design only such houses. In other words, design studio should not aim at achieving such rigid final outcomes; in other words, how to design rather than what to design or improving design thinking rather than shaping tools to create a final product [29].

Teaching students to fine-tune their design process should be the underlying objective of design studio. The facilitator should clearly emphasize that objective to make the participating students understand why they should enrol in the studio. More importantly, the facilitator should guide students in design knowledge-

construction as well to develop their skills in time management. Among the responsibilities of the facilitator is providing reading materials, case experiencing, guidance to working alone as well as in groups, progress checks. In order to shape up a cycling process to achieve the goals of students while realizing the learning objectives of the design studio, the facilitator becomes plays the key role.

Next step for a facilitator is developing an action plan for the design studio. This action plan can be developed based on those issues discussed earlier. For example, who would do the learning can be detailed in such a way that the design studio is meant for the student and student's learning, demanding more involvement of the student. It is important to emphasize that the design studio has no physical boundaries or geographical locations, and the student could continue learning outside the classroom. The facilitator's role is checking their learning in terms of the objectives of the design studio. It is rather difficult to delineate time allocations for teacher and student in design studio but it is always good to have a vague idea in terms of proportions. An action plan of a design studio should also indicate the start of learning as well as its completion. Among the most intricate parts of the action plan is assessing the achievements of various phases of learning. Most teachers appear to support the idea of assessing the final product presented by a student against assessing the development of a design process. It is always easier to assess a tangible product than an intangible process. There are also a significant number of teachers who consider giving more weightage to the final product while assessing their so-called interim products. It must be noted that shaping an assessment for the design process is extremely complicated but could involve the student more in the learning process. We could understand that such formative assessments are more learning-oriented than interim or summative assessments. Since a design studio should not have a definite closure- only the one who took a house design studio can design a house or the one who took a house design studio is the only one who can design house. The design studio, regardless of its topic, shall enhance the design knowledge of the participant and fine-tune his/ her design process. This is why the action plan prepared for a design studio, and particularly its completion, should be more intricately detailed to assess the learning process.

A teacher who plays role of a facilitator could promote such a reinvigorated learning by giving feedback continuously in an organized manner. We have found that many teachers do provide constructive criticisms to students at various stages, thus encouraging student-engagement. A facilitator has to develop a structured yet flexible method of giving feedback, and further explain how such feedback could be used by students. We complain that our multitasking students have no time to incorporate our feedback that was provided more like the 'end of the storey'. Our students seem to have conceived such feedback as a part and parcel of the completed assignment, and there is no need to carry them forward. Our failure to make them understand that feedback could be used for learning has resulted in them repeating their mistakes. We seem to be lethargically concluding that today's multitaskers have no time to read our feedback without making any attempts to see why they did not take our feedback seriously as a way of continuing their learning. One technique we have used was asking the students to reflect on feedback to ensure that they read our feedback and make an attempt to understand its content. It has been suggested to redefine feedback as feedforward to ensure such

a continuous dialogue with students [30]. Among the strengths of feedforward are involving students, their interpretations and expression of ideas as well as creating them at different levels of their engagement. An action plan that promotes such a continuous dialogue seems to ensure the purpose of a design studio run by a facilitator. The students have shown confidence that they can make decisions as learners thus giving glimpses of future decision makers.

Concluding remarks

Many of us have been using design studios to teach, yet without playing the role of a facilitator. We seem to be continuing our traditional teaching modes that trained us as designers- just like a crafts-person learns to hold tools by looking at the master. The teacher-role should drastically change from the classroom to the design studio. Some of us tried various changes with or without success, or failed to continue them due to the pressure from school administration or peers. Our paper describes lessons learnt from such attempts that have shown us improvement of student engagement. We present our research results here with the intentions of creating a forum to discuss innovative attempts made on knowledge-construction and knowledge-dissemination. Our observation of lack of student engagement resulted by teacher-domination in design studio took us to search for the strengths of learner-oriented design studios.

We must ensure that our students feel the open-endedness of design studio as a learning space. They should also be able to understand that the intention of design studio is learning a design process. The facilitator shall explain that this process may get further convoluted when real clients are involved. We often hear that students' design projects should be buildable and acceptable to various legislative authorities thus emphasizing their utility values. At the same time, there are educators who would argue for creativity against the utility value. Both categories seem to teach the students how to design, yet with different levels of student engagement and with different learning outcomes. The first category seems to be dependent on summative assessments whereas the second category intends to further develop formative assessments. We collected sufficient evidence, in terms of student satisfaction and confidence, to suggest that they developed a sound design process and therefore can absorb the external pressure from real-world clients. The focus of giving training on the process rather than a product will eventually make them more socially-fitting designers.

The pedagogical basis emphasized here aims not only at learning by doing but also at integrating the collaboration of various doers, and their unique methods of doing. This is why a teacher, playing the role of a facilitator may encourage learning. The importance of providing an appropriate social infrastructure in learning was evident in our experimental design studios, where a spontaneous social infrastructure emerged as the usual studio norms was made silent [31]. It is important to understand the significance of facilitating such an infrastructure for creative learning, and only a facilitator who could provide feedforward could develop such a design studio. As a whole, sharing the decision-making with students could empower them in the design studio thus encouraging their learning through participation.

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