



Collaborative and participatory design approach in architectural design studios



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ABSTRACT

The architectural design studio is an important process, which aims to shape the skill, knowledge, and sensitivities of students and enhances their lateral thinking as well as their problem solving skills. Design studio process is quite important in design education since it is the core of the curriculum and all the courses taught in design education are related and contribute to the design studio. The aim of this paper is to share a new method in architectural design studio teaching, which is the participatory approach in architectural design studio. The studio explored the participatory design process with potential intervention in primary school design for IV semester students in Department of Architecture, PRIMENEST College of Architecture and Planning, Tiruchirappalli, India. After completion of the project, a questionnaire survey was conducted among the students and the faculty, and the main findings are discussed in the paper. This article reports on lessons learnt from these participatory learning experiences, which reflect on contemporary design practiced.

1. Introduction

“Pedagogy is the art and science of teaching”. The term generally refers to strategies of instruction, or a style of instruction. Pedagogy is also occasionally referred to as the correct use of instructive strategies. Effective learning results from quality pedagogy and this is a thorough and lasting acquisition of the knowledge, skills, and values the teacher or the institution has set out to impart” (1). The design studio is the nucleus of the architectural programme where the architecture student explores and experiments various architectural projects and imparts the basic skills and knowledge required for architectural profession. In spite of design studios being the heart of most architectural curriculum, few efforts have been made to determine what makes for excellent studio teaching. Different architectural schools have unique philosophies and pedagogical methods that are distinct from others (2). The design studio is an environment where the students will be able to complete their work as well as discuss the tasks at hand with their peers, tutors, and critics. The studio is a place where formal and informal learning happens and students are encouraged to maximise the usage of Studio hours in order to develop the best possible learning outcomes. Participatory design is a dynamic process that involves two major factors: first it initiates

awareness among students, of the concept of “cultural design”, which is a term used to indicate design that conscientiously attempts to make design suitable to the culture of the design perceiver (user). Participatory design helps students gain experience in understanding the various cultural components, and the need to incorporate cultural requirements. Second is the user participation during the design process taking place in design progress at early design process stage as an efficient tool of understanding the user needs and preferences (3). The paper presents a case study of participatory approach for design students as a new design teaching mechanism within the design studio.

2. Literature review

Design procedure is full of repeated actions which lie between a problem definition and the solution of this problem. It is the research and decision making process that defines the problem to be solved by design (4). As a result of complex social change and behavioural issues involved in the contemporary context and since recently design is considered as an applied behavioural science, the role of the designer needs to be reshaped (3). The term community architecture can be traced back to the early 1970's when the then President of the RIBA, Fred Pooley, used it to refer

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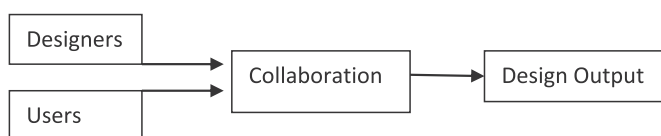
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to the provision of architecture for the community by local authorities (5). This definition was contested (e.g. [Wates & Kneivitt, 1987](#), p. 32) and in fact was greatly expanded over the next two decades to refer to the provision of a wide number of related built environment professional services, which included not only architecture but also planning, landscape, surveying and even graphic design, to enable local groups to actively participate in the (re)development of their environment. [Wates & Kneivitt, 1987:119](#) argued that as “the built environment is too complex and interdependent to be fragmented ... it has to be treated as a whole system”. To this end they place a greater emphasis on “the process of development than ... the end product”, noting that the most appropriate solution to local group’s problems may not even necessitate an architectural input ([Jenkins, Milner, & Sharpe, 2010](#)). Programming is generally viewed as an information processing system setting out design directions that will accommodate the needs of users, the client, the designer, or the developer (6). [Hasanin \(1997\)](#) has concluded an abstract presentation of the differences between traditional design process and the participatory design model. Function in architecture is not simply efficiency in terms of area, circulation, construction technique etc but encompasses human needs such as identity, self-expression, security, privacy, social interaction, territoriality, sense of belonging, symbolic aesthetics, adaptability, aesthetics, to name a few. These needs vary depending on time and socio cultural contexts. Hence, it is inappropriate to simplify and generalise concepts in human behaviour and built environment. It is necessary, design is considered as an applied behavioural science and the role of the designer needs to be reshaped ([Abeer, 2013](#)). However, historically the education of an architect has been a highly individualized pursuit, focused on the development of an individual skill set that seldom includes collaboration beyond that of student and professor ([Thomas McPeck and Dockter, 2019](#)). Meiss, states that a design studio shall not be a relation with two sides, in which one knows all and the other doesn’t, the relation shall be a partnership of an experienced and an inexperienced person who are looking to understand information together ([Meiss, 1995](#)). Conventional teaching design, a project-type design exercises focuses on students’ understanding of design theory – not to practice design ([Iveren & Buur, 2002](#)). The different schools of design have evolved different models such as case problem (experimental) model, the analogical model, the participatory model (community based design learning), the hidden curriculum model, the pattern language model, the concept-test model, the double layered model, the energy conscious model, the exploratory model, the interactional model ([Salama, 1995, 2009](#)). Lettl (2007) identified three qualifications needed for the participant for efficient Collaboration and originality. These were a *driving force caused by the issues*, and *sincere effort to adapt to new technologies*, and *imagination capabilities*. Lettl further developed this theory by presenting a three-layer model for participant involvement in innovation. This included *passive development contribution in the user domain*, *active development contribution in the user domain*, and *active development contribution in the technological domain*. In their article present the Participatory Design (PD) Collaboration System Model as a tool for planning and assessing PD projects. The model consists of the following components: designer and participant knowledge, activities (for making, telling, and enacting), design environment and materials, society and culture, and the participants’ capacity to participate. PD Model has become widely used for designing contextually suitable solutions and authorizes the users to have increased ownership over the process and the Design outcome (20, 21).



Traditional Model for Participatory Design ([Hussain, 2012](#)) (20, 21).

[Hussain \(2012\)](#) expanded on this model to show the actual stages required to achieve effective collaboration during a PD project. According to [Sanders and Stappers \(2008\)](#), the co-creation design process transforms the design thinking and evaluation methods and changes how and what designers attempt to design and who designs, this in turn will affect the ways and means used in the design process and also in the training and education process. The limited number of serious studies coupled with emerging concerns about undergraduate pedagogy in universities indicates the urgent need for more published discussions and research on the evolutionary aspects of design teaching as well as on contemporary design studio pedagogy ([Salama, 2009](#)). [Marta Masdéu \(2017\)](#) stated that the design studio is considered as the core of education in architecture and needs a reformation in pedagogical approaches such as distance learning and blend learning can help update the concept of the design studio and transform it into a new participatory and delocalized learning spaces. [Khalid S. Al-Hagla \(2012\)](#) proposed a more comprehensive approach that draws the relation between macro- and micro-scale interventions to guarantee a better performance of the transdisciplinary and interdisciplinary aspects in architectural education. Lots of research on participatory and Collaborative Design has been done in the design of information systems, consumer products, workplace layout, and humanitarian solutions ([Drain & Sanders, 2019](#)). In architectural design studios, the greatest challenge for students is often preliminary stage of the project, when they need to determine the main idea and concept and decide on their priorities based on the user. The research problem emerges when students face difficulty in translating the collected data of the users available from library and internet sources into actions to engage the initial idea of the project. But from literatures, it was found that there are very less explorations in pedagogical approaches in participatory and collaborative models in architectural design studios. Especially user’s needs and aspirations and their involvement in each phase of the design process from the initial concept to the final assessment stage are relatively low. The user needs are mostly looked upon as functional needs and their physiological and psychological needs were often not considered. This paper attempts to evaluate the difference between the traditional approach of design studio learning and the participatory approach. It also investigates effectiveness of the participatory design studio process in enabling students to make design decisions that are sensitive to the context taking into account the needs, beliefs, values, and culture of the end user by making them a part of the design decision process. It is necessary that design pedagogy train architecture students to engage in incorporating cultural and social element as objective in user centric design for which the participatory model is investigated in this study. The objective is to recommend a practical strategy for bridging the gap between the users/communities and the designers from the concept stage to the final design stage of design. This study attempts to investigate and understand how the user is involved in the design of primary school project and their experiences are taken into account by architecture students in their design process. The study adopts two research methods. One is proposing a new educational structure and applying it to the architectural design studio at PRIMENEST College of Architecture and Planning, Trichy, Tamilnadu, India. The other is conducting a questionnaire survey among students and review members to evaluate the efficiency of the proposed structure (Participatory and Collaborative) in helping them bridge the gap between the users and the final design (12–16).

2.1. Conventional teaching pedagogy in architectural design studios

The conventional design studios consist primarily of two phases, the study phase, and design phase. The study phase focuses on understanding the problem while the design stage is solution oriented. Conventional design studios spend less time in the study phase and more in the design phase. In the study phase the students are introduced to the basic program of the project followed by a study of standards, case studies and site study. The design phase is much more elaborate and includes sub phases

such as concept, detailed design etc. Hence the design process is solution oriented. The design in such studios addresses a wide scope and large user groups. The design approach is global and the solutions are predominantly generic and formal. The designer takes into account the needs of the client rather than the end user and the design solution reflects more of the designer's preferences. The design proposals usually use advanced or conventional technology. The conventional design process has been well tested and followed all over the world since the advent of modern architectural pedagogy. However there has been raising awareness in architecture regarding the significance of context based and user based design. All designers who are concerned with improving the quality of their efforts and the quality of everyday life should consider participation through user involvement (7). One of modern architectures' failure is its lack of context that resulted in poor post occupancy performance of built environments such as the Pruitt Igoe housing project in St. Louis. The conventional design process followed in studios was fashioned based on the principles of modern architecture. This process gives rise to a number of issues. The most important issue is the students consider users as passive recipients of an environment conceived. This leads to the designer overlooking some fundamental problems the design needs to address. The problems identified without a deeper understanding of the user's needs and preference results in identifying and listing of generic and superficial problems to be solved in the concept stage. Eventually the concept developed based on these problems identified tends to be vague and arbitrary. The ability of the designer to approach the design in the shoes of the user is a significant quality to be instilled in students. Secondly the studio environment is faculty centric. The lack of a strong concept makes the subsequent design decisions difficult and hence the students approach the design to satisfy the faculty and jury members. Students are often influenced by their tutors, their architectural ideas, philosophies and approaches. Students mostly concentrate on the end product than the process (Table 1).

2.2. Participatory design studios

Architectural schools have been predominantly following the modern design pedagogy developed by the Bauhaus school almost a century. This approach combined art (aesthetics) and practical skills (technology) in design to suit the industrial world. In the 21st century with the changing needs and approaches in architecture, new and alternate methods of design philosophies are being incorporated in many schools. The criticism to lack of acknowledgement of context and design being approached as an individualistic process has necessitated experiments in design studios to evolve new methods that enhance the student's perception of design from the end users point and emphasize the collaborative nature of architectural design. Architectural design education needs to emphasis issues related to culture-design relationships (2). The participatory design approach is one such experimental approach that focuses on

reducing the gap between the designer and user. A typical participatory design studio addresses a narrow range or small groups specific to that place. The design emphasis is on analysing and understanding the context (local/regional). It sensitises students of the context and takes into account the needs of the user, their beliefs, values, and culture as an important aspect to be reflected in the design. The students focus on decoding intangible aspects such as meaning and cultural values and explore its role in the design of built environments. In some designs the context could also be echo in the use of available local materials and technology (Table 2).

3. Research methods

The research method integrated both qualitative and quantitative approaches consecutively through documentation, study and analysis, followed by a questionnaire survey to students, faculty coordinators and review members. A new teaching pedagogy, participatory and collaborative design Studio for the architectural students at PRIME NEST College of Architecture and Planning, Tiruchirappalli was experimented by one of the authors (S.Radhakrishnan) followed by a questionnaire survey to assess the quality of the students output in the proposed pedagogical system. The outcome of the survey evaluates whether the proposed participatory learning methods helps to achieve the outcome.

3.1. Structuring the participatory design studio

In contrast to the conventional design studio, once the project brief is introduced, the student directly starts working focussing only on the design outcome, in the participatory method, the design process is strategized in such a way that the student focuses equally on understanding the problem rather than kick starting the solution. The participatory approach enables the student to empathize with the end user through multiple interactions with the user at various stages of the design process. The participatory design process methodology was experimented at PRIME NEST School of Architecture in the design of a primary school. This studio offered the learning opportunity of responding to user's requirements by directly involving them in the program formulation and design process to create socially and environmentally responsible architecture. The students were divided into groups and each group has to identify and engage the users in their design process. This unified process allows the students to interact with users at all stages in their design process. At the beginning of the studio a group of forty students were divided into ten groups of average four students in a group and they were asked to design primary school with participatory approach. Each group was handed the project brief, objectives, as well as evaluation pattern. Each group was allotted with few primary school children and school teachers to collaborate in the design process from early phases of design like framing of detailed project brief till the final

Table 1
Conventional design studio process.

Various Stages in Architectural Design Studios	Stages	Expected deliverables	Duration	evaluation
Project Introduction Pre- Design Stage	Data Collections and Standards, Literature Studies, Case studies	Sketches, Photographs, Documentation and Analysis	First Week II, III and IV Weeks	Design Coordinator Studio Instructor
Design Stage	Site Analysis Concept Development	Sketches, Initial ideas through sketches, Working in Plans, Sections and views simultaneously	V, VI and VII Week	Design Coordinator Studio Instructor Visiting faculty
Design Development	Site Analysis Site Sections Detail Presentation drawings	Detailed Working drawings, Interior layouts, Structural Layout, Services Layout, 3D model, Views	VIII, IX and X Week	Design Coordinator Studio Instructor Visiting Faculty
Final Internal Assessment			XI WEEK	Design Coordinator Studio Instructor External review member

Table 2
Participatory design studio process.

Various Stages in Architectural Design Studios	Stages	USERS	Duration	evaluation
Project Introduction			First Week	
Pre- Design Stage	Data Collections and Standards, Literature Studies, Case studies	USERS/COMMUNITY/INDUSTRY ARE INVOLVED IN THE DESIGN PROCESS	II, III and IV Weeks	Design Coordinator Studio Instructor
Design Stage	Site Analysis Concept Development		V, VI and VII Week	Design Coordinator Studio Instructor Visiting faculty
Design Development	Site Analysis Site Sections Detail Presentation drawings		VIII, IX and X Week	Design Coordinator Studio Instructor Visiting Faculty
Final Internal Assessment			XI WEEK	Design Coordinator Studio Instructor External review member

evaluation stage. The students were given presentations by the faculty about the objective of this participatory design process and how they can utilise the users effectively in various stages of design process. The authors prepared two questionnaires, the first one was given to narrate their experiences in conventional design studios, and the second questionnaire was given at the end of the semester after the final evaluation stage of the project which addressed the effectiveness of participatory design.

3.2. Stage I: Defining the goals and objective of the project

The objective of this stage was to first initiate among the students an exploration and comprehension on the notion of a primary school and its fundamental purpose. This is necessary since such an exploration reveals new ideas and opens the possibility of rethinking the concept of learning and hence learning spaces. The study on the fundamental purpose and activity of the built environment to be designed allows the designers to evolve radically new programs and spaces that are not confined idea of existing concepts of learning spaces. This stage involved interaction with various users of a primary school, study of literature on various philosophies of education and learning spaces, and recollect the notion of school from the designers own experience. The project brief was introduced to the students. The project brief was consciously designed to provide the larger framework of the design and allow freedom for the designer to evolve the program requirements and other details. A very detailed project brief had the disadvantage of standardising the program requirements for all students and subsequently limiting their design exploration. The students brainstorm the project brief which allowed the possibility of approaching the project from multiple angles.

3.3. Interaction with participants

The next step involved the designer and the participants, where participatory design sessions are organised with small groups of primary school children and their teachers. The methods employed here include enacting, dialogue, brain storming, idea writing, drawing cartoons, sketching, questionnaire etc. At this stage, the participants in their own words produce ideas and define their exact needs and preferences towards the design of learning spaces in a primary school. [Allan et al.](#), (9, 10), [Demirbilek and Demirkan \(2004\)](#) have pointed out the difficulties in trying to extract information from children, without putting ideas into their heads. Hence more than one method is used to interact and obtain data from the participants. All the sessions were recorded on videos to recall in the later stages.

3.4. Mind mapping

Each group was asked to capture the memories and experiences of the school, do a mental mapping of their school, and present it in the form of

a storyboard with sketches and cartoons. The above assignment was discussed with the users and the students are asked to connect with people and space. This allowed students to comprehend the essence of a school and link it with the layers of architectural spaces and forms.

3.5. Literature studies

Students refer various literatures on school and learning spaces from sources such as magazines, periodicals, newspaper articles, books etc. The literature study gave equal importance to the comprehension of the philosophy, activity of learning and the corresponding architectural space. The study aimed at.

- Answering fundamental questions like ‘what is a school?’
- Knowing the primary user group i.e., primary school age group, their needs and interests
- Understanding the various philosophies and theories of education systems, transformation from traditional learning practices to current practices w.r.t both the system and its resultant spaces, i.e., transformation from Indian gurukulam system where teaching learning process happened under a tree then to the semi open space to learning now in an enclosed space
- Understanding the innovative teaching learning methodologies adopted in rural and urban schools.
- Knowledge on the governing bodies of schools (primary education)
- Familiarise with the overall system and organizational structure of the school.
- Understand and analyse various spatial planning principles, concepts and philosophies of various architects
- Exposure to standards and guidelines –National Building Codes, Timesaver standards, Neuferts data etc.

Nonconventional sources of data and literature such as movies, documentaries, slide shows were also analysed to understand the essence of learning spaces.

3.6. Defining goals and objectives of the project

After initial discussions with users and literature study, the students were asked to list the goals and objectives of their design. The goal was to design a school in the simplest way possible to enhance the young minds of children, provide an efficient workplace for teachers and staff, and promote a spirit of community. This included objectives such as innovation (visionary educational approach), informal learning (promote social interaction outside class room enhancing learning), inclusion (design aspects for all, including physically handicapped), flexibility (design aspects for wide range of activities), adaptability (future adaptations to changing needs), environmental performance (comfort of the

users), safety and security (safe and secure campus for children like defined site boundaries preventing unwanted entry of visitors), circulation (interesting circulation system for the school members as well as visitors), image (instilling the values of creativity, productivity, and resourcefulness), privacy – (high degree of control of interaction and distraction within their work/study places) (Duerk, 1993) (12).

3.7. Stage II Case study

The next step involved conducting case studies by the students. The student groups visited schools in the region and conducted a detailed case study. During the case studies the users were involved in various stages like documentation, analysis, and inferences. The case study gives the students the opportunity to understand and analyse important aspects of a school w.r.t it's functioning and its built environment. Table 3 presents the topics covered in the case study, the different users who participated in the interactions and the deliverables obtained. In the site analysis, the students documented and analysed location of the school in relation to the neighbourhood, site planning through analysis of various factors such as circulation, landscape, climatic data, parking, buildings with area, site services etc. Apart from the conventional data collection, the interaction with parents and teachers gave students important indicators on site selection, site level zones used by different users, and the practical difficulties encountered by them. The students interacted with the teachers and the administrative members of the school to gain insight of the overall framework of the schools administrative and day to day functioning (Figs. 1 and 2). The students comprehended the pros and cons of various learning cultures and philosophies such as Montessori, gurukul, collaborative method etc., through literature studies and interaction with educationalists. The link between different learning cultures and learning environments were established in this study. This was further studied in relevance to the various teaching-learning process and methodologies such as passive teaching, active learning, peer learning, experiential learning, play-way learning etc., along with the corresponding differences in the needs of functioning and its built environment. Students explored the concept of innovative teaching methods innovative learning spaces which encompassed various types of spaces such as indoor, outdoor, semi open, Informal, flexible learning spaces (openness to change and opportunities to partner/spaces which are used for wide range of learning activities), shared spaces, interactive spaces (used for students interaction, staff student interaction, parents staff etc), spill over spaces (example-an activity which spills over from the classroom to the corridors, lobby spaces etc), Analysis of temporal spaces (based on the timeline how the space responds to various activities in a school), clustering classrooms for small group work, display spaces, teachers and students spaces etc and their influence. The feedback from the school children on the different types of learning was significant in aiding design decisions in the later stages. They also evaluated the efficiency of current educational spaces: classrooms, seminars, laboratories etc through observations and interactions with the users. After understanding the individual spaces that constituted a school, students critically appraised relationship and connectivity between buildings, open spaces, semi open spaces, and spill over spaces, formal and informal spaces etc, the different types of connections and connecting spaces employed. The interaction with the user groups gave insight on the degree of success and efficiency of spaces. Since the primary users of a school are children it was necessary to convey the significance of anthropometry in this design project. Hence a study was conducted involving a sample of fifty children (twenty five boys and twenty five girls) from various classes (III Std to V Std.). Students documented the various anthropometrical and ergonomic details such height of blackboards in relation to seating arrangement, storage spaces, issues in toilets, seating layouts, parking lots, etc.. Important issues such as furniture layouts, lighting level, and spatial comfort in classrooms were also discussed as unstructured interviews and questionnaires. The data was consolidated and conclusions were arrived. The user behaviour in

Table 3
Topics analysed in case study.

S. No	Study topic	Interaction	Expected deliverables
1.	Context, Location of the School, Site Analysis	Teachers and parents	Analysis drawings of site location and planning in the form of site layout, sections supported with maps, photographs, sketches etc
2.	School educational system i.e., administrative, pedagogy, programmes, policies etc.	Teachers, Administrators	Various systems presented through flow charts, pictures and sketches
3.	Learning Culture vs. Learning Environment	Teachers	Comparative study of various systems in the form of reports, sketches and photographs - Documentation and analysis of architectural spaces as plans, sections etc
4.	Teaching Learning process and methodologies	Teachers	Critical understanding of various methods presented as plans, sections, sketches, and photographs.
5.	Staff Student ratio	Teachers	Report
6.	Innovative teaching and learning modalities- Concept of innovative learning spaces	Teachers and Children	Analysis through plans, sections, interior layouts, sketches, photographs, models, 3d views (with measurements)
7.	Understand the relationship, connectivity of spaces in the built environment.	Teachers and Students	Analysis through plan, sections, interior layout of various classrooms, faculty rooms, administrative offices photographs, model, sketches, 3D views etc
8.	Anthropometry	Primary School children	Consolidation of Questions and sketches with dimensions on anthropometry and ergonomics.
10.	Users behaviour Studies	Architecture students and primary school teachers	Behavioural pattern analysis through sketches, photographs, plans, statistical figures and views.
11.	Structure/Materials and Technology	Architecture students	Documentation drawings illustrating foundation, structural grids, materials for building envelope (wall, roof, floor, Interiors) etc
12.	Climatic Analysis	Observation by Architecture Students	Plans, Sections, sketches, and charts.
13.	Form	Teachers and Children	3D views, sketches and models

different spaces were documented through observations and analysed. The study shed light on how children of various age groups, teachers, and public experience the various layers of volumes and spaces. Apart from these conventional data, analysis of the structural and constructional aspects of the built environment were document and their impact on the user was analysed. The climatic response of the buildings with respect to orientation, shading devices, day lighting (window opening size, location of windows etc), ventilation (position of openings) etc were analysed and its manifestation on user preferences were noted. The numerous participation of the users in different aspects of the case study enabled students to realize practical functioning of spaces and interaction between people and spaces. This gave them significant proficiency in the design stage



Fig. 1. Interaction with school students.

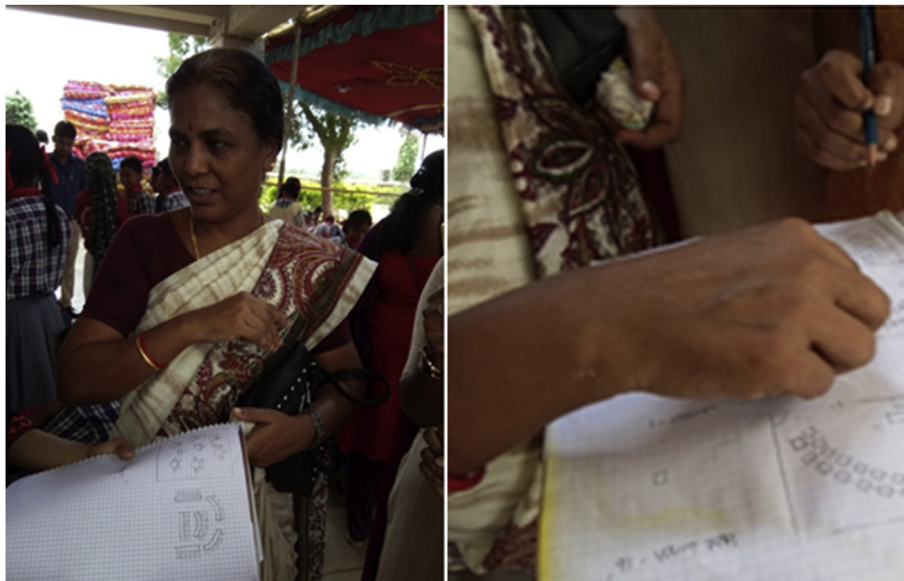


Fig. 2. Interaction with School teachers.

helping them take design decisions with sensitivity and confidence.

3.8. Stage III - Site visits

Each group was taken to the site and asked to do intuitive analysis of the site. The students were asked to document the details and elements of the site and experience the site during various time of the day. The students presented their analysis and ideas in sketches, photographs, maps, and videos etc.

3.9. Second participatory design sessions results

3.9.1. Stage IV - Concept development

The students discussed with the school children to identify the best interior layout for various curricular, co-curricular and extracurricular activities in the school and the different layouts were discussed with their teachers. Finally the students brainstormed and listed down various issues in the schools. Each group was guided by their tutors to look at the design through issues, which is the guiding factor through which they approach the design. Students interacted with their, peers, tutors, architects and faculty from other departments to arrive at their concept. Students were requested to present their thoughts, observation, and ideas through sketching, collage, study models, drawings, and videos to capture the spirit of the place. The designer does not make any proposals for

the design at the beginning but acts as a facilitator. The design ideas are made by the children and teachers themselves in a rough sketch.

3.10. Jury panel

The jury panel of a conventional design process is usually composed of practising architects and academicians. This approach lagged the input and perspectives of the end users of the designed environment. Hence in the participatory design process the jury panel comprises of studio coordinator, practising architect, school teachers, and children. The drawings of the conceptual designs were shown to the same small groups of school children and school teachers in the second participatory design sessions, as a round table discussion (Fig. 3). The student's team made a presentation of the conceptual design of primary school explaining how they were conceived and how they related to the ideas and requirements that were pointed out during the first and second stage of discussions. To make the design easily understandable for the school children and teachers, conceptual models were also made. The studio coordinator encouraged the school teachers and students to make comments, corrections, and contributions directly on models. The school teachers were acting as jury members in criticising the design. This jury enabled students to get first hand feed-back on their design and the user's expectations. The subjective nature of the design jury opinions were curtailed to a certain extent and the criticism were more objective.



Fig. 3. Design review.

4. Research hypothesis

The proposed study aimed to understand the correlation between the participatory approach and the quality of student’s works assessed at the end of the jury and also investigate the effectiveness of the participatory design studio process. The hypothesis is that an extensive correlation exists between the participatory and collaborative user centric teaching methods in the design process and the student’s ability to generate appropriate concepts/ideas for their projects and enhanced students confidence level in design decisions was tested by a quantitative questionnaire survey.

5. Methodology

The authors carried out an organised literature review to identify the current understanding of participatory design collaboration. Several theoretical models and frameworks were identified as important to our study (Hasanin, 1997; Abeer, 2013; Sanoff, 1992; Sanoff, 1990; Demirbilek & Demirkan, 2004; Christiaans, 1992; Gerrard & Sosa, 2014; Hussain, 2012) (1–12). Next, the authors carried out the qualitative research design and collaborated with an architectural school and experimented the conventional design models and the participatory design models with the architectural students in the design studios and their works were assessed and evaluated. The quantitative survey focused on examining students’ interaction level with the users/participants and measuring the students, design coordinators and the jury members satisfactory level in assessing the quality of students works during the conventional and participatory design process in the architectural design studio. The quantitative analysis was carried out by the questionnaire survey consisted of five questions which were planned to cover the primary design aspects that need to be assessed like design parameters and issues, project needs and goals, concepts/ideas, design reviews and design decisions. The quantitative survey questionnaire followed likert values – low (Strongly disagree – one point scale, disagree-two point scale) moderate (neutral – three point scale), high (Agree-four point scale and Strongly agree-five point scale) All the five questions in the questionnaire had a measurement scale based on research questions. The data was collected through online tool and the questionnaire was sent and the responses from the students, design coordinators and review members were collected immediately after the final design review of the semester. The collected datas were analysed through SPSS statistical Software. The conventional design studio was held for four months during January 2018 to April 2018 (V semester) and the collaborative and participative design studio workshop was organised during August, 2018 to November, 2018 during VI semester for the group of forty students. The sample size for this workshop was restricted to forty students, four studio coordinators and four external jury members. Initially, students were

briefed about the research methods, and they were given the project brief and the design requirements for reviews and final submission. The studio coordinators used questionnaire survey to analyse the data and the students were briefed about the objectives of the survey. The questionnaire format was designed and given to the students, jury members and the faculty coordinators at the end of the workshop to review their views on collaborative process. Its main intention was to harmonize the correlation between their previous semester conventional practice and the next semester collaborative practice and their effectiveness in improving the quality of the students project. The questionnaire was divided in to two sections, section – A comprises of their private data - name, year, semester, designation and their previous experiences in the design studio. Section – B comprises of set of open ended questions related to their design studio process – both conventional and participatory approach and how they perceive both studios. Figs. 4–8 shows the list of questions given to the students and they were asked to rate in a percentage of high, moderate and low as per Likert values. The questionnaire survey method provided valuable insight towards the participatory and collaborative environment directly from the student participants (Table 4) (18,19,20) (Eman, 2020).

6. Findings

The analysis and the findings of the questionnaire survey are

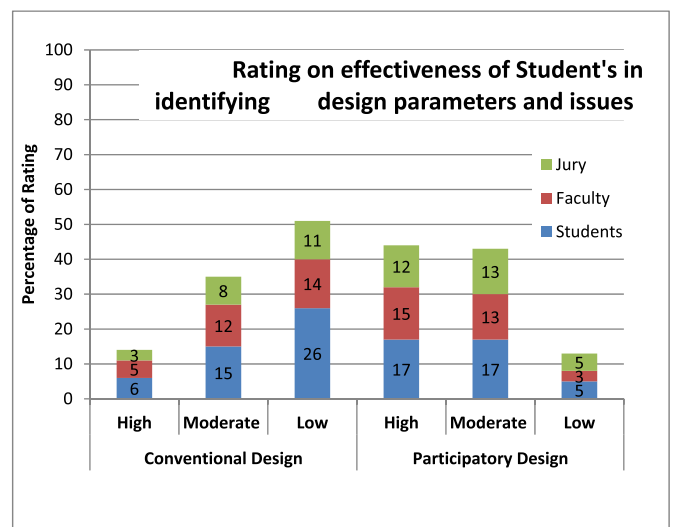


Fig. 4. Rating on effectiveness of Student’s in identifying design parameters and issues.

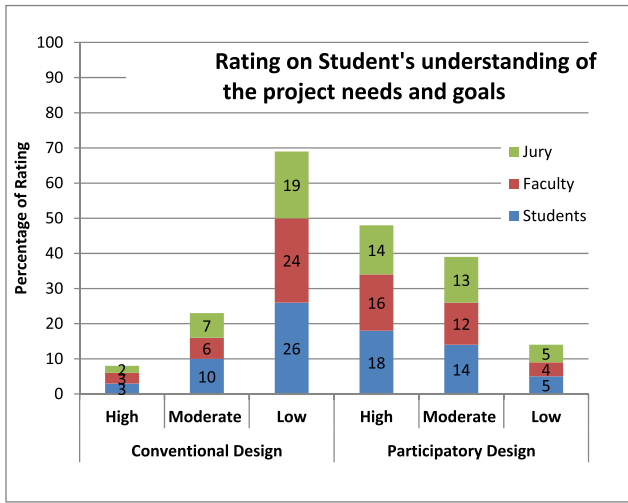


Fig. 5. Rating on Student's understanding of the project needs and goals.

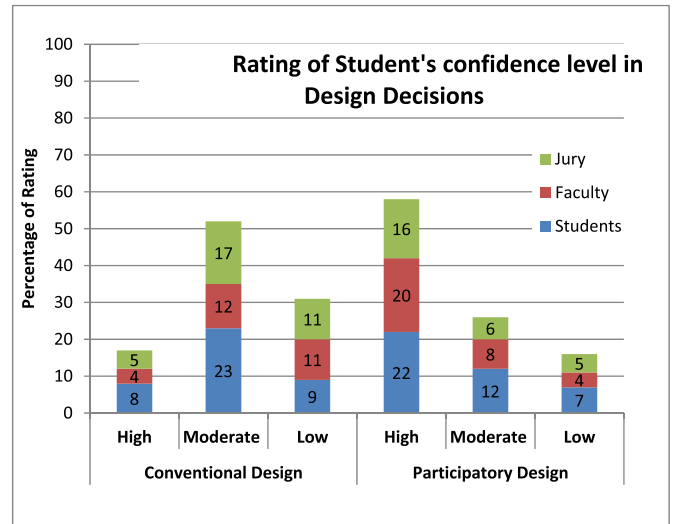


Fig. 8. Rating of Student's confidence level in design decisions.

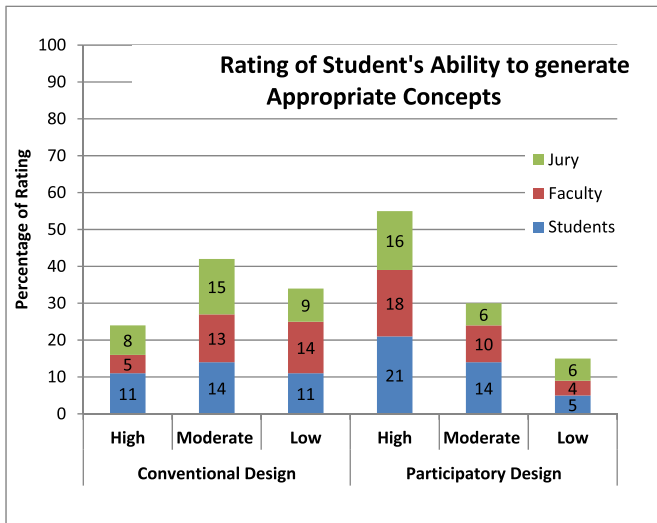


Fig. 6. Rating of Student's ability to generate appropriate concepts.

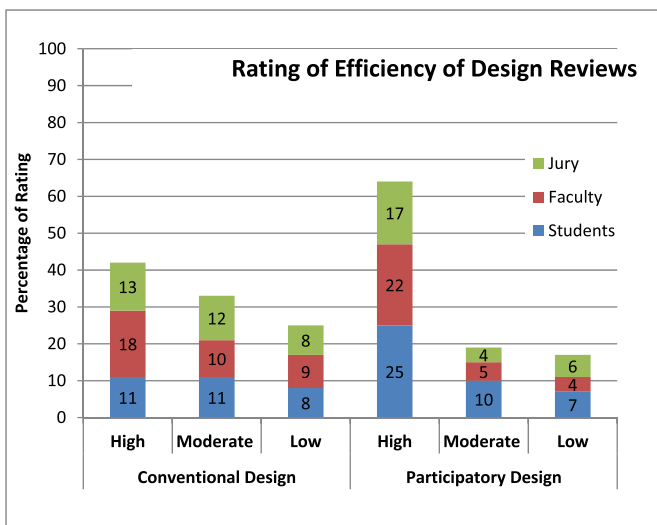


Fig. 7. Rating of efficiency of design reviews.

presented in Tables 5 and 6. For the first question, the survey participants were asked to rate the effectiveness of students in identifying design parameters and issues in both the conventional and participatory studios. The studio coordinators, jury members and the students stated that they found it difficult in understanding the design issues in conventional studios without the users interaction and hence they chose low values in the measurement scales with the mean value of 1, 0.75 and 0.92 and for the participatory design studios they stated that it was easy to understand the design issues directly by interacting with the users, so they chose high values in the measurement scale with the mean values of 4.2, 4.5 and 4.1. For the second question, the survey participants were asked to rate students understanding of the project needs and goals in both the conventional and participatory studios. The respondents found it hard to understand the project needs and goals without interacting with the community/industry in the conventional design process, so they chose low values in the measurement scale with the mean values of 0.75, 0.5 and 0.85 while in the participatory studios formulating needs and goals of the projects with the help of the community, industry was beneficial, so they chose high values in the measurement scales with the mean value of 5, 4.7, 4.8. For the third question, the participants were asked to rate on the student's ability to generate appropriate concepts/ideas for their projects in architectural design. The studio coordinators and jury members stated that the students started their design without any conceptual design ideas or process and the students stated they encountered difficulty in arriving at the ideas/concepts for their projects in the conventional studio, so they chose low values in the measurement scale varying from 0.2, 0.1 to 0.8 while in the participatory studios the participants stated that they were able to come up with varied design ideas and process through mind mapping, brainstorming with peers, and interacting with community, so they chose high values in the measurement scale with the mean values of 4.7, 4.5 and 4. For the fourth question, the participants were asked to rate on efficiency of design reviews. The studio coordinators and jury members stated that in the participatory design process the students were able to present design reviews in a structured and organised way with the help of documentations, analysis, concept development and the final output, so they chose high values in the measurement scale with mean values ranging from 4.25, 4, and 4.25 whereas in conventional design process the students presents their design ideas without proper sequence and structure in their presentation, so they chose low values in the measurement scale and the mean value ranging from 1.5, 1.7 and 0.9. For the fifth question, the respondents were asked to rate the students confidence level in design decisions. The respondents stated that the students confidence level and clarity in the design process in the review system was found to be effective, so they

Table 4

Questionnaire Survey Format: High Values – Strongly agree – 5 point scale and Agree- 4 point scale, Moderate values- Neutral Scale – 3 point Scale, Low Values – Strongly disagree- 1 point scale, Disagree- 2 point scale.

Aspects measured	Survey Questions	Participants of the Survey	Conventional Design (Measurement Scale)			Participatory Design (Measurement Scale)		
			High	Moderate	Low	High	Moderate	Low
Design parameters and issues	Q1. Rating the effectiveness of students in identifying design parameters and issues	Faculty Coordinators Jury Members Students	High (4-5)	Moderate (3)	Low (1-2)	High (4-5)	Moderate (3)	Low (1-2)
Project needs and Goals	Q2. Rating on Students Understanding of the Project needs and goals	Faculty Coordinators Jury Members Students	High (4-5)	Moderate (3)	Low (1-2)	High (4-5)	Moderate (3)	Low (1-2)
Concepts/ideas	Q3. Rating on students ability to generate Appropriate Concepts/ideas for their projects/Architectural Design	Faculty Coordinators Jury Members Students	High (4-5)	Moderate (3)	Low (1-2)	High (4-5)	Moderate (3)	Low (1-2)
Design Reviews	Q4. Rating on Efficiency of Design Reviews	Faculty Coordinators Jury Members Students	High (4-5)	Moderate (3)	Low (1-2)	High (4-5)	Moderate (3)	Low (1-2)
Design decisions	Q5. Rating of Students Confidence Level in Design decisions	Faculty Coordinators Jury Members Students	High (4-5)	Moderate (3)	Low (1-2)	High (4-5)	Moderate (3)	Low (1-2)

Table 5

Participants response for the Survey – Conventional Design Process.

Aspects measured	Survey Questions	Participants of the Survey	Conventional Design (Measurement Scale)					
			High	Moderate	Low	Number of respondents	mean	Standard deviation
Design parameters and issues	Q1. Rating the effectiveness of students in identifying design parameters and issues	Faculty	4-5	3	1-2	4	1.0000	0.000
		Coordinators	4-5	3	1-2	4	0.7500	0.4330
		Jury Members Students	4-5	3	1-2	40	0.9250	0.5651
Project needs and Goals	Q2. Rating on Students Understanding of the Project needs and goals	Faculty	4-5	3	1-2	4	0.7500	0.4330
		Coordinators	4-5	3	1-2	4	0.5000	0.5000
		Jury Members Students	4-5	3	1-2	40	0.8500	0.4769
Concepts/ideas	Q3. Rating on students ability to generate Appropriate Concepts/ideas for their projects/Architectural Design	Faculty	4-5	3	1-2	4	0.2500	0.4330
		Coordinators	4-5	3	1-2	4	1.0000	0.7070
		Jury Members Students	4-5	3	1-2	40	0.8250	0.3799
Design Reviews	Q4. Rating on Efficiency of Design Reviews	Faculty	4-5	3	1-2	4	1.5000	0.5000
		Coordinators	4-5	3	1-2	4	1.7500	0.4330
		Jury Members Students	4-5	3	1-2	40	0.9700	0.5238
Design decisions	Q5. Rating of Students Confidence Level in Design decisions	Faculty	4-5	3	1-2	4	0.2500	0.4330
		Coordinators	4-5	3	1-2	4	0.5000	0.5000
		Jury Members Students	4-5	3	1-2	40	0.7750	0.4170

chose high values in the measurement scale and the mean ranging from 4.5, 4.2 and 4 in the participatory Design process and they stated in conventional studios the confidence level of the students in the design process was found to be not satisfactory, so they chose low values in the measurement scale and the mean values ranging from 0.2, 0.5 to 0.7 respectively. The statistical method was used for the correlation analysis to evaluate the research hypothesis to find out whether considerable relationship exists between participatory and collaborative user centric teaching methods in the design process, the students ability to generate appropriate concepts/ideas for their projects and enhanced students confidence level in design decisions. In conventional design process the relationship between students identifying design parameters and issues and the student's ability to generate concepts indicated a very weak correlation in the correlation test results (Pearson Correlation - 0.2957) between the two variables. In conventional design process the students

were not able to arrive at the concepts without understanding the user's needs and issues whereas in participatory design process the relationship between students identifying design parameters and issues and the student's ability to generate concepts indicated a very strong correlation in the correlation test results (Pearson Correlation - 0.8371) between the two variables because the students were able to generate appropriate design ideas and concepts for their projects when they identify the user needs and their issues and hence the hypothesis is proved (Table 7) (Figs. 9 and 10) (19).

7. Results and discussion

At the end of the final jury, feedback of the design process was collected in the form of questionnaires and discussions with students, faculty and jury members to evaluate effectiveness of participatory

Table 6
Participants response for the Survey – Participatory Design Process (Eman, 2020).

Aspects measured	Survey Questions	Participants of the Survey	Participatory Design (Measurement Scale)					
			High	Moderate	Low	Respondents-Numbers	mean	Standard deviation
Design parameters and issues	Q1. Rating the effectiveness of students in identifying design parameters and issues	Faculty Coordinators	4-5	3	1-2	4	4.250	0.4330
		Jury Members	4-5	3	1-2	4	4.500	0.5000
		Students	4-5	3	1-2	40	4.150	1.0610
Project needs and Goals	Q2.Rating on Students Understanding of the Project needs and goals	Faculty	4-5	3	1-2	4	5.000	0.0000
		Coordinators	4-5	3	1-2	4	4.750	0.4330
		Jury Members	4-5	3	1-2	40	4.825	0.3799
Concepts/ideas	Q3.Rating on students ability to generate Appropriate Concepts/ideas for their projects/Architectural Design	Faculty	4-5	3	1-2	4	4.750	0.4330
		Coordinators	4-5	3	1-2	4	4.500	0.5000
		Jury Members	4-5	3	1-2	40	3.875	1.6153
Design Reviews	Q4. Rating on Efficiency of Design Reviews	Faculty	4-5	3	1-2	4	4.250	0.8291
		Coordinators	4-5	3	1-2	4	4.000	1.2247
		Jury Members	4-5	3	1-2	40	4.250	1.2399
Design decisions	Q5. Rating of Students Confidence Level in Design decisions	Faculty	4-5	3	1-2	4	4.000	0.7071
		Coordinators	4-5	3	1-2	4	4.500	0.5000
		Jury Members	4-5	3	1-2	40	4.600	0.5385

Table 7
Correlation analysis.

	Variable 1	Variable 2	Pearson Correlation
Conventional Design Process	Q1. identifying design parameters and issues	Q3. Students ability to generate Appropriate Concepts/ideas for their Projects/ Architectural Design	0.2957 (very weak Correlation)
Participatory Design Process	Q1. identifying design parameters and issues	Q3.Students ability to generate Appropriate Concepts/ideas for their Projects/ Architectural Design	0.8371 (Very Strong Correlation)

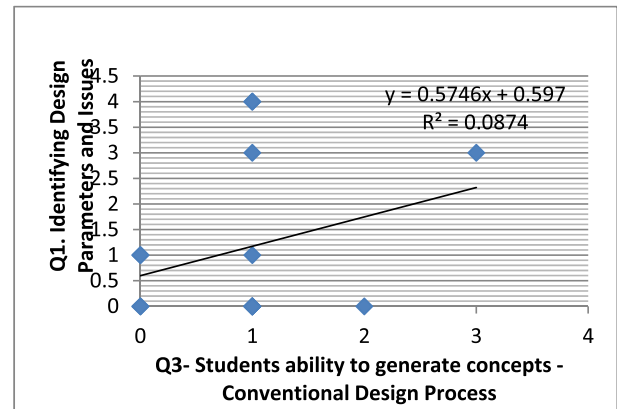


Fig. 10. Correlation analysis – Conventional Design Process.

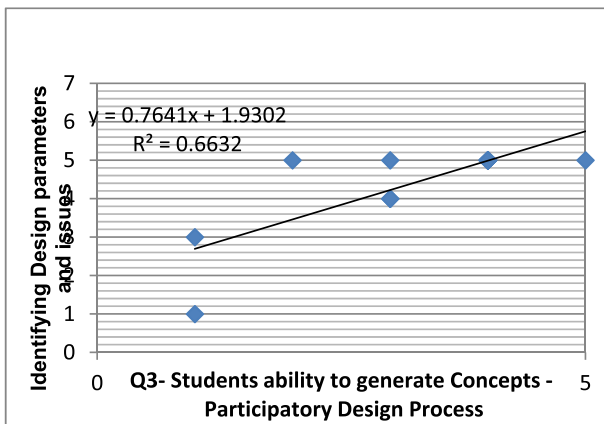


Fig. 9. Correlation analysis – Participatory Design Process.

design process over the conventional process. In any design process the first step is identifying the issues and parameters that significantly affect the built environment to be designed. These issues later translate as the goals and objectives of the project. The evolution of a strong and appropriate concept that forms the base of a good design is determined

by the validity of the goals derived. Design process is a series of design decisions and the capacity to make informed design decisions with confidence is crucial for a good design outcome. Hence the students were asked to evaluate the participatory design process against the conventional design process with respect to parameters such as ability to identify design parameters and issues, understanding of the project needs and goals, ability to generate appropriate concepts, confidence in design decisions, efficiency of design reviews, apart from overall outcomes and issues encountered during the design process. The following are the results of the feedback. The students, faculty, and jury rated the efficiency in identifying design parameters and issues during the pre-design phase based on their experiences of conventional design and participatory design process (Figs. 4–8). In this regard, only 14% found the conventional design process efficient against 44% percent in the participatory design process (Fig. 4). The insight offered by the users in the participatory helped students identify relevant and specific issues that users faced in the said built environments and the parameters that determine the quality of the built environment. The rating on understanding of the goals and needs of the design project demonstrated that only 8 percent found the conventional design effective while 48 percent found it easier to comprehend the projects needs in the participatory approach (Fig. 5).

Identifying the goals and needs of a design project is very significant in the pre-design phase. In the conventional process the students found it likely to only establish broader – generic needs of the project based on overall understanding from literature and their own experiences. This generic nature of the needs was often found to be incapable of converting into real design solutions. This problem did not exist in the participatory design process since the students were able to get hands-on understanding on the needs of the users and were able to translate the goals into objective design qualities. The limited insight on the user needs and issues encountered in the built environment in a conventional design process also reflected in most students having similar goals and having an indistinct approach to concept generation (only 24 percent felt students were able to evolve strong concepts) whereas in the participatory approach the input given by the users resulted in stronger goals and subsequently stronger concepts i.e., 55 percent (Fig. 6). During the entire design process, the design decision taken in each stage by the designer determined progress and refinement of the design proposal. Clarity and confidence in the design decisions was seen to be higher in the participatory approach i.e., 58 percent against the conventional design process i.e., 17 percent (Fig. 8). The students, faculty, and jury found that the design decisions taken in the conventional design process were generic and arbitrary while the decisions in the participatory approach were articulate and specific. Design reviews play an important role in refining the design of students. The involvement of user groups in the review provided authentic feedback of design. The reviews from architecture teachers, building users such as school students and teachers, and practising architects gave multiple perspectives of the design. Hence the participatory approach of design was rated as more efficient at 64 percent than the conventional reviews at 42 percent (Fig. 7). The overall feedback based on discussions also suggested that the participatory approach helped students understand the built environment much better with the insights from users themselves. However a few issues encountered in the process such as longer time consumed by the study phase resulting in lesser time for detailed design drawings, coordination of several stakeholders of design for the meetings, skilled teachers to streamline the focus of interactions and discussions etc. However most of the issues would be solved once the faculty adapt to the new process which had more benefits than the conventional process. Students of architecture are exposed to various building typologies in their education intended to give exposure to understand the needs of varied user groups and different contexts. In the conventional process the design decisions are solely based on the student's experience of the typology and the reviewer's perspective of the built environment designed. The limitation of experience as actual users of the built environment for both the students and the reviewers pose a hurdle in accurately understanding the user needs. The participatory and collaborative method is a more efficient system since the inputs and interactions of the users give more clarity in the design decisions and approach the design from multiple perspectives. A significant difference was found between the traditional approach of design studio learning and the participatory approach. The participatory design approach gave a better insight at identifying issues to be addressed in design unlike the conventional approach where the issues identified are more arbitrary, especially for students with little previous design experience. Hence the pitfall of addressing the wrong or assumption based issue in design was avoided in the participatory approach. The goals of the design were closely linked to the actual needs of the particular project and hence were more likely to be context responsive and specific to the site, people, and their culture. The difficulty generally encountered by architecture students in comprehending and evolving appropriate concepts were simplified and the participatory approach gave better clarity on the understanding the link between design problem, concept and design. A coherent understanding of demands of the design project from the perspective of the end user reflected in significant increase in the confidence in the series of design decisions by the students which in turn echoed in articulate and efficient design reviews since the jury also included the end users of built environment to

be designed. It also investigates effectiveness of the participatory design studio process in enabling students to make design decisions that are sensitive to the context and takes into account the needs, beliefs, values, and culture of the end user by making them a part of the design decision process. It is necessary that design pedagogy train architecture students to engage in incorporating cultural and social element as objective in user centric design.

8. Conclusions

In this approach, students interacted with peers, teachers, people from industry and the community with budgets and timeframe constraints. The study proved that students could successfully work with a community and build confidence in their own abilities when placed in a real setting, which enabled interactions face-to-face and at a distance to solve a challenge and achieve a common goal. Teachers and primary school children actively participate in the sessions and they have proven to be a potential source for designers. This was achieved by the collaboration of all from the beginning till the end of the project. This study demonstrated that the initial stages of design, critical for the final outcome which is usually vague and assumption based was considerably demystified for the students in the participatory design approach. The rating of better performance of the participatory approach increased as the design process progressed indicating that though the method was initially rated with certain amount of reservations on its effectiveness on the end output, the ability of the faculty and jury to keep the approach on track by moderating the participants input and relating it to architectural design vocabulary is crucial in this approach. The output of this collaborative and participatory process has broadened the perspective of the designer about the opinions, requirements, ideas, and solutions of the users during the design process. This approach can be used in the Design studios for getting direct feedback and critical comments from the users from the project formulation and later in the concept stage. Some of their ideas helped the students in formulating their design. The above participatory and collaborative model has been done in only one studio and in the future this Model can be adopted in the curricula of the architectural education and this represents a change in the way of teaching in schools of architecture engaged on traditional system as well as in the profession.

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