

Review Article

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Examining the Effectiveness of Evaluating an Open-Ended Task

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ABSTRACT

The process of edification is undergoing changes rapidly. 'Undergraduate research' is gaining momentum in the current context. In Asia, higher education institutions are grappling to meet the minimum standards of education, questioning research at the undergraduate level. Besides, teachers need the basic knowledge as well as an inquiring mind to foster 'systematic investigation' among the young minds. With an intention to instigate systematic investigation among the teachers so as to facilitate 'undergraduate research', a practicum focusing on 'assessment' was organized as part of a Faculty Development Programme (FDP) at Department of architecture at Sathyabama Institute of Science and Technology, which was conducted in association with Council of Architecture – Training and Research centre. The practicum revolved around the evaluation of the emergent outcomes of an open-ended design task titled 'grids'. The activities were planned sequentially as worksheets so as to give an insight into evaluating the creativity manifested in the emergent outcomes of a basic design task. Teachers with architectural background participated in the FDP voluntarily. Around 65% of participants had plans to pursue research in the near future. Qualitative and quantitative data were collected through pre and post-tests, worksheets as well as questionnaires. Mixed methods were adopted to foster a direction to investigate the emergent outcome systematically among the participants as well to construct the knowledge about the framed practicum from wider as well as diverse perspectives. Findings indicate that the direction adopted is effective to foster 'methodological triangulation', paving a way to critically comprehend and explore the quality of instructions and level of learning among the students in architectural design studios. With the experience gained through planning the practicum, the authors have modified Maher's model to formulate open ended tasks.

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Introduction

Blackmore and Blackwell have posited that the nature of edification and related issues are changing rapidly [1]. According to Harden and Crosby, roles of teachers are recognized as 'the information provider in the lecture, role model on the job and in more formal teaching settings, the facilitator as a mentor and learning facilitator, student assessor and curriculum evaluator, curriculum and course planner, resource material creator and study guide produces [2]. It is observed that the faculty members need to play several roles such as 'teacher, content expert, designer, counsellor, evaluator, organiser and scholar' [3].

The 'Council of Undergraduate Research' and 'National conference on Undergraduate Research' have acknowledged 'undergraduate research' as the pedagogy for the 21st century, nurturing research culture from the students' and teachers' perspectives [4]. This emphasizes that 'research informed strategies' need to be adopted for effective teaching in higher education [5]. To achieve this goal, the teachers need to have an inquisitive mind and the ability to explore study area through systematic investigation.

In Asian countries, the increase in the number of enrolments have led to the higher education institutions to be preoccupied in meeting the minimum academic provisions rather than improving quality of instructions as well as the learning [5]. 'Undergraduate

Research' is observed to be challenging in developing countries as most of the institutions grapple to meet the minimum standards of education. There is an utmost need to shift the focus towards 'undergraduate research' to meet the requirements of education in today's context. This reinstates that the teachers need to construct knowledge to instigate the ability to foster the novices to explore specific topics systematically through various directions at the undergraduate level itself. To meet the goal, the teachers need to have 'basic' or 'adequate' knowledge about 'research' as well as inquisitive mind to be effective. It is against this background; the authors have identified a direction to foster 'research' abilities that focused on evaluating the emergent outcomes of a basic design task in architectural education.

Architectural Education: Research Teaching Nexus

Piatkowska noted the essence of 'research' has affected architectural education [6]. It is posited that the link between research and teaching in architectural education is strong and observed to be a 'research teaching nexus'[7]. 'Research-teaching nexus is multifaceted, as it affects several aspects of higher education, but also relates in many ways to policy making, pedagogy, academic teaching, and research'[8]. According to Griffiths teaching is distinguished as 'research-led, research-oriented and research-based' revolving around 'information transmission is the main teaching mode,' 'staff members try to engender a research ethos through their teaching,' and 'inquiry-based activities' respectively [9].

Architectural education is considered as a vocational subject from both the teachers’ as well as students’ perspectives [7]. The academic design studios have interesting potentials to be explored as research studies [10]. With respect to architectural education in Indian context, ‘research’ is often limited to the formulation of program in design thesis during the tenth semester [11]. However, from the literature studies, the authors have observed various research strands that have been associated with the design studios as ‘assessment of the emergent outcomes in design studios’, ‘creativity’, gender studies; ‘pedagogy’ ‘collaborative learning’ ‘evaluation of online teaching of design studio to name a few [12-26]. This article focuses on ‘assessment’ that is essential for all the teachers to comprehend the quality of instructions adopted in design studios as well as the level of learning from the students’ perspectives.

An insight into ‘assessment for learning’ Literature studies reveal that ‘subjectivity’ rules while evaluating the emergent outcomes of open ended or generative tasks in diverse design based domains. The role of ‘assessment’ is changing and is currently addressed as a tool to explore the development of students’ progress in learning [27]. A task addressing the evaluating the emergent outcomes of a basic design task were formulated for the teachers to give an insight into a direction revolving around teaching as a research nexus.

Effective assessment is deeply intertwined with both teaching and learning. ‘Assessment for learning’ is the process of searching and understanding practices adopted by both students and instructors to determine the level of learning by exploring the outcomes as well as the process adopted to achieve the same [28]. It is formative in nature and occur at all stages and providing immediate feedback to both teachers and students emphasizing strengths, identifying challenges, and encouraging students to be responsible for better performance [29].

Anticipating that the knowledge constructed through experiential learning adopting research strategies will enable the teachers to foster research at the undergraduate level, a series of activities were planned as part of a faculty development programme. This article gives an insight into the ‘assessment of the emergent outcomes in design studios’ through a practicum, primarily to enhance the abilities of the teachers to foster the novices at the undergraduate level to explore, interpret or investigate any topic systematically.

Assessments in Architectural Design Studios

Architectural education includes both formative and summative assessment based on qualitative methods and widely accepted to be subjective nature [30]. The evaluation process needs to be guided rationally as otherwise the jurors’ perspectives are considered to be the most significant aspect and students’ learning process remain underexplored [13]. Phillips has posited that analytic scoring scales, primary trait analyses and collaboratively developed rubrics are effective in measuring the degree of innovation in a design studio [14]. As already discussed, directions to evaluate ‘creativity’ among the emergent outcomes of an open-ended task are challenging and yet to be explored.

Triangulation is observed as a potential strand to investigate ‘creativity’ manifested in the emergent outcomes of open-ended tasks in design studios [15]. Studies reveal that ‘triangulation’ addresses alternative perspectives to validate, challenge or extend the finding. In the social sciences, triangulation refers to the application and combination of several research methods to study, investigate and understand a phenomenon comprehensively.

‘Triangulation’ is observed to play a significant role especially while investigating the processes and outcomes of an open-ended task [15]. According to Denzin, there are four types of triangulations: data triangulation, investigator triangulation, theory triangulation and methodological triangulation as summarized in Table 1 [31]. With an intention to given an insight into the potentials of triangulation to overcome ‘subjectivity’, a practicum that revolved the emergent outcomes of an open-ended task in a basic design studio was framed. The methods adopted served as a tool to construct rich knowledge about ‘product, process and the hard skills’ specific to the identified outcomes. Among the four types of triangulations, this study intends to foster the fundamentals of methodological triangulation with a thrust on ‘using more than one option to gather data, such as interviews, observations, questionnaires, and documents’.

Table 1: Types of Triangulations

Types		Description
Data triangulation	involves	Time, space, and persons
Investigator triangulation		Multiple researchers in an investigation
Theory triangulation		Using more than one theoretical scheme in the interpretation of the phenomenon
Methodological triangulation		Using more than one option to gather data, such as interviews, observations, questionnaires, and documents.

Basic Design Tasks

In architectural pedagogy, the design studio in the first semester stimulates and enhances tangible and intangible abilities among the novices [32]. Basic design studio plays a significant role in initiating and enhancing creativity through the ‘progressive evolution of form, license of borrowing from other arts and deconstruction or [33]. It aims to provide the students the fundamental skills and knowledge needed for design education in order to understand the fundamentals of the architectural language [34]. Basic design studio revolves around ‘cognition, visual perception-knowledge-opinion and aesthetic realization, process of exploration-inspiration-creation, developing and raising the abilities of hand-eye brain, activation of dream-imagination-intuition’ [35]. Williams, Ostwald and Askland posited that research is required into ‘the concept of creativity, the teaching of creativity and the subsequent assessment of students’ creative outcomes [36].’ Focusing on the ‘assessment of the emergent outcomes in design studios,’ this article explores and examines a research informed strategy that was adopted to foster ‘rationality’ among the participants of a FDP while assessing the emergent outcomes of a basic design task.

An Insight into FDP

Faculty development has been described as ‘an institutional process which seeks to modify the attitudes, skills, and behaviour of faculty members toward greater competence and effectiveness in meeting student needs, their own needs, and the needs of the institution’ [37]. During the 1970s, the faculty development programmes focused on enhancing the ‘instructional development, organizational and personal development’[38]. Besides, the thrust areas of the development programmes have been instructional, professional, organizational, career and personal developments [39]. Such development programmes need to enhance the performance of the faculty members in teaching, research and administration [40]. Rubino has observed faculty development

programme to be a two-dimensional activity: professional dimension that included instructional, curriculum development and research skills; personal dimension that addressed the relationship with colleagues, students and their own wellness and health [41].

Design and development of FDPs is yet to gain rigor in design disciplines such as architecture and software engineering [42]. Kala and Chaubey have identified that ‘research methodology’ is the most preferred area in FDP that facilitate the publication of quality papers in journals [43]. This article revolves around a direction to foster the abilities to investigate a topic systematically among the teachers with a focus on ‘assessment’ in ‘architectural education’. This direction is adopted with an intention to inculcate abilities to investigate topics systematically among the novices at the undergraduate level as well as to give an insight into the importance of ‘assessment’ giving an insight into the level of learning and the quality of the instructions adopted.

Architectural Education and Governing Bodies in India

The Indian Architects Act was passed in 1972 and the Council of Architecture (COA) was formed as the regulatory body of the profession as well as the architectural education. According to the Minimum standards of education , ‘research skills and project introduction’ was identified and offered as a theory course in the undergraduate programme. Besides, COA has stated that architects with one-year professional experience is the minimum criteria to be a teacher in the current scenario. According to the Minimum standards of education, ‘Dissertation or research methodology’ is acknowledged as a ‘professional ability enhancement compulsory course’. From 2017 onwards, FDPs for the teachers of architecture have been organized by the Council of architecture, Training and Research Centre (COA-TRC), so as to build the capacities of the teachers in architectural domain.

FDPs Organized by COA-TRC in Indian Context

The thrust areas of the diverse programmes from January 2017 to December 2020 have been consolidated from the website (www.coa.gov.in). The topics have been synthesized and categorized under four heads such as ‘personal development’, ‘research’, ‘instruction’ and ‘course content’. It has been observed that most of the training programmes focused on the ‘course content’ followed by ‘instructional development’ that accounted nearly 74.26% and 17.82% respectively as shown in Figure 1. Nearly 8.91% of the programmes addressed ‘research’ as the focus area. In the four years, only one programme on ‘personal development’ has been conducted.

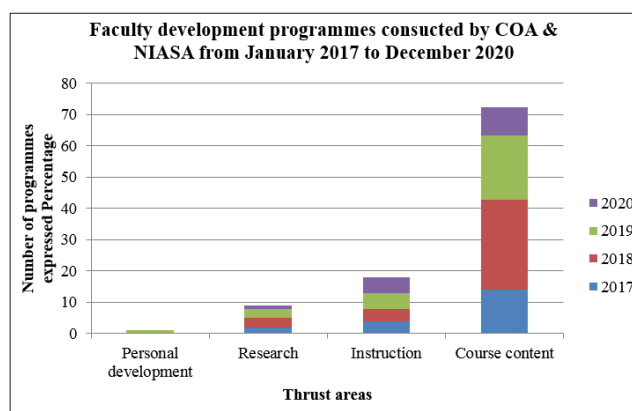


Figure 1: Thrust areas of FDPs conducted by COA-TRC from January 2017 to December 2020

Methodology

A mixed methods approach tends to base knowledge claims on pragmatic grounds [44]. Mixed method research is defined as ‘the class of research where the researcher combines quantitative and qualitative research techniques, methods, approaches or language in to a single study through induction, deduction and abduction’[45]. According to Venkatesh, Brown and Bala, the decision to conduct mixed method research depends on the research question, purpose and context. Creswell has posited that mixed methods research is appropriate to investigate the success of a program [46]. Among the various mixed method designs, exploratory design is effective in exploring a phenomenon in depth [47,48]. Mixed method research usually adopts closed ended questionnaire and the collection of data through observations in the framed settings [49]. According to Al-Musawi, attitudinal questionnaires, pre and post-tests, observations, videotaped practices, written reports and assignments as tools to evaluate the professional development programmes planned for the faculty members [50]. The ‘fit of ‘data integration refers to the coherence of qualitative and quantitative findings for confirmation, expansion and discordance [51]. However, data integration plays a significant

role that requires innovations [52,53]. It is against this background; mixed methods analysis was identified as a potential strand to be fostered among the participants while evaluating emergent outcomes. Besides, the authors adopted the same methodology to investigate the effectiveness of the framed practicum through sequentially planned activities.

About the Sessions and the Framed Task

Department of Architecture, Sathyabama Institute of Science and Technology, India organized a Faculty Development Programme in association with Council of Architecture and National Institute of Advanced studies in architecture titled ‘Methodology and exploration in architectural research’ from 3rd to 7th February 2020. For this, the authors had planned two lectures that focused on ‘methodology, data collection and analysis from a broader perspective’ and ‘a direction to investigate the emergent outcomes of a basic design task,’ giving an insight into triangulation on 4th and 6th February 2020 respectively for two and four hours respectively as in Table 2. The activities were formulated based on the methodology posited by Dorst and Cross [54].

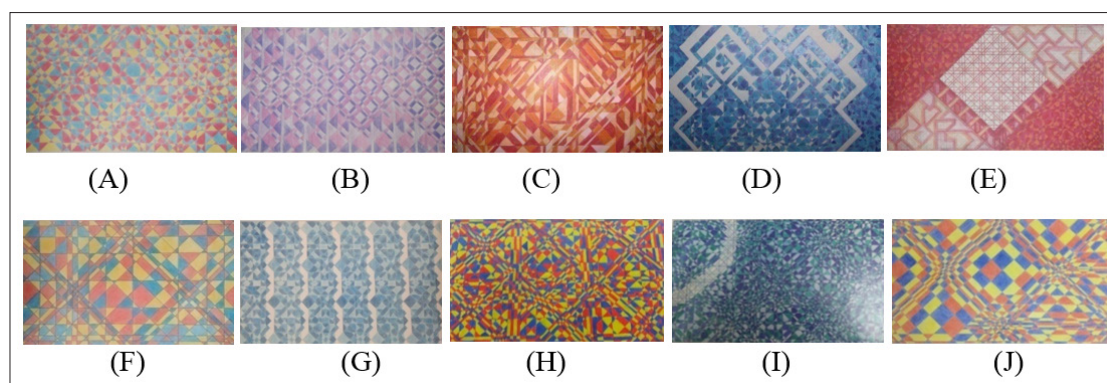
Table 2: An Insight into the Pre, During and Post Practicum

Framing the practicum: The authors executed the sequentially framed activities through the evaluation of three emergent outcomes of ‘grids’ with three skilled assessors to examine the sequencing of the identified activities involved.					
The sessions		The activities			
Day I (4th February 2020)	Pre test collected by the authors	Overall impression score, identification of additional parameters by the participants, rating of each parameter on a seven point Likert scale			An insight into the calculation of correlation between the overall impression scores and the individual parameters for all the participants by the authors
	Introduction to the framed task	Triangulation	Participants (evaluation)	Method I	Overall impression score
Day II (6th February 2020)	Introduction to triangulation; Evaluation of the emergent outcomes and Demonstration of the findings of the task done before the workshop and the display the values of the correlation coefficients as calculated by the authors			Method II	Identification of additional parameters
					Correlation between overall impression score and the individual parameters
					Method III
At the end of the programmes			Authors (practicum)	Method I	Pre and Post tests
				Method II	Feedback collect by the authors (formally and informally)
	Method III				Feedback forms by COA
				Post practicum : Investigation of the effectiveness of the direction adopted in framing the practicum	

The session planned on 6th February 2020 gave an insight into 'research design' that included terms such as 'Likert scale and types, correlation, determining the Pearson's correlation coefficients using the online calculator available in the website 'www.socscistatistics.com,' scatter plot diagram, interpreting the values, and coding. Besides, Wong's two-dimensional design principles focusing on 'variations in the basic grid, patterns of gradation, gradation structure anomaly and concentration, inductive and deductive reasoning, mixed methods and types, fundamentals of triangulation' were also incorporated.

For this purpose, 'grids,' a design task that was introduced as part of a basic design studio for the students who pursued first semester from August to December 2016 at the Department of architecture, Sathyabama Institute of Science and Technology was identified. With an intention to foster the 'Fibonacci series' as a channel to creativity, the students were asked to create grids by selecting three consecutive numbers along the horizontal and vertical axis in a graph sheets. Besides, the students were given a freedom to follow the same or a different series along the diagonals. In the graph, either 0.5 or 1cm was considered as a single unit along the horizontal, vertical including the two diagonal axes. Students were directed to identify three colours to create patterns in the generated grids.

With an intention to give an insight into triangulation, ten emergent outcomes based on the 'grids' were identified as shown in Figure 1. The task framed exclusively for the faculty members at the FDP was to unravel the essence of triangulation by evaluating the outcomes through a practicum.



The Identified Ten Emergent Outcomes

The framed task was planned and conducted as part of two sessions that was conducted on the 4th and 6th February 2020 for duration of two and four hours respectively. On the first day, fifteen minutes were allotted for the participants to fill the pretest questionnaire. The authors gave an insight into the various types of research designs adopted in architecture domain.

On 6th February 2020, the images of the emergent outcomes in A3 size sheets were pinned up along with the nomenclature identified as the alphabets from 'A to J.' Besides the images of the grammars for interpreting the 'variations in the basic grid,' 'patterns of gradation,' 'anomaly' and 'concentration' as posited by Wong were also pinned up along with the emergent outcomes. 'Variations in the basic grid' include 'change of proportion, change of direction, sliding, curving and bending, reflecting, zigzag, further dividing, triangular grid and hexagonal grid.' The 'patterns of gradation' comprised 'parallel, concentric and zigzag.' Images of 'anomalies' that attract attention, relieves monotony, transforms regularity and breaks down regularity and 'concentration' 'towards and away from a point as well as a line, free, over and sparse' were taken printouts individually in A3 size paper were also pinned up in the same size to facilitate the participants to decode the emergent outcomes qualitatively.

Participants

Around nineteen architects (6 males and 13 females; average age: 34.4 years and 5.05 years as the average professional experience) from the teaching profession participated voluntarily in the Programme. Among the participants, around 36.84% of the participants had already registered for research in 2019. With an intention to construct knowledge about 'methodology' so as to pursue research in the near future, the others had registered for this programme.

Data Collection

The authors discussed the need, importance as well as the fundamentals of triangulation. Along with the session, the framed task comprised of a series of activities that were planned sequentially for the participants as shown in Table 3. The images of the emergent outcomes were also projected to the participants while explaining the sequentially planned activities. Both qualitative and quantitative data were collected through structured questionnaires as in Appendixes A, B, C, D and E. Besides, the knowledge constructed by the participants about 'triangulation' was also collected on 6th February 2020.

The formats for pre and post-tests, images of all the emergent outcomes for the entering the overall impression scores, assessing the manifestations of the identified parameters for all the outcomes, determination of the correlations between the overall impression scores and ratings for the parameters, interpreting the correlation, consolidation of the findings, decoding the emergent outcomes based on Wong's principles. The activities were planned sequentially in the form of worksheets and were bound in the form of a booklet. The identified emergent outcomes were coded with numbers ranging from one to nineteen. The booklets were circulated to the participants at the beginning of the session and collected from them at the end of the session on both the days. The pretest and the first two activities were completed on 3rd February 2020, whereas the other activities were completed by the participants on 6th February 2020.

Feedbacks for the sessions planned by the authors were collected in three ways. Firstly, diverse opinions from the participants were collected by the feedback forms framed exclusively for the participants by the authors. Cronbach alpha was determined to establish the reliability of the structured questionnaire [55]. Secondly, the responses specific to this session were collected from the feedback forms framed by Council of Architecture. Thirdly, the authors collected the opinions informally from the participants [56-58].

Table 3: Activities Planned Sequentially for Fostering the Fundamentals of Triangulation

Description of the activities planned sequentially						Data	Analysis
Individual	Pre test (Prior knowledge before the session planned on Day I)					Qualitative	Quantitative
	First	The framed task	Day I (4th August 2020)	Overall impression score for the identified ten emergent outcomes on a ten point scale individually	Appendix A	Qualitative and Quantitative	
Second (collective)				Identification of additional parameters collectively for analysing the emergent outcomes			
	Third			Rating the degree of each parameter for all the ten emergent outcomes individually on a seven point Likert scale			
Individual	Fourth			Conversion of overall impression score to seven point scale	Appendix B		
	Fifth		Day II (6th August 2020)	Determining the correlation between the overall impression score and the scores for each parameter by the participants			
				Interpreting the correlation relationship between the same and identifying the parameters with ‘strong’ and ‘very strong’ relationships	Appendix C	Quantitative	Qualitative
	Sixth			Interpreting the features of the emergent outcomes based on ‘variations of the basic grid,’ ‘patterns of gradation,’ ‘gradation structure,’ & ‘concentration’; Identification of parameters with strong and very strong relationship with overall impression scores			Qualitative
	Seventh			Interpreting the relationship between the total number of parameters and features with the overall impression score	Appendix D		
	Post test (Knowledge constructed after completing the planned activities on Day II)						
Feedbacks			About the framed task as well as the two sessions planned along with the sequentially framed activities giving an insight into direction adopted by the authors on Day II	Appendix E		Quantitative	
			Collected on 7th August 2020 by Council of Architecture on a three point Likert scale				

Data Analysis

The analysis of data focused on two issues. Firstly, the knowledge constructed by the participants, opinions on content of the sessions as well as the framed task was gathered. Secondly, successful completion of the various activities that were planned sequentially to foster evaluation process that focused on the level of understanding from the participants' perspectives. Firstly, the pre and post-tests addressed the knowledge constructed by the participants. Besides, feedbacks given by the participants focused on the contents of the lectures associated with the activities planned as part of the framed task. Feedbacks collected through the framed structured questionnaire by authors, Council of architecture well as the informal feedbacks given by the participants were consolidated and analysed.

Secondly, processes unravelled during the assessment of the emergent outcomes gave an insight into a direction to triangulate data to the participants. Successful completions of the sequentially planned activities were analyzed to interpret the degree of knowledge

constructed by the participants. The findings were limited to construct a holistic picture of the sessions and tasks framed to examine the effectiveness of the adopted direction.

Findings

Pre and Post Test

The responses by the nineteen participants for the pre and post tests were obtained as shown in Figure 2. The findings display that the participants were completely aware of the terms such as ‘qualitative’ and ‘quantitative.’ From the responses in the pre test, the authors observed that most of the participants were unaware of ‘odd point scale, even point scale, intraraters and interraters.’ However, nearly 57.8% of the participants were aware of the terms like ‘scatter plot and coding.’ In the post tests, it was noted that nearly all the participants were aware of the terms such as ‘mixed methods, Likert scale, intraraters, interraters, Pearson’s correlation coefficient, coding, triangulation, multiple methods, exploratory and explanatory.’ More than 90% of the participants were familiar with ‘odd point scale, even point scale, respondents’ ratings, inductive, deductive, multiple theories, multiple data, multiple researchers, data integration and validation.’ The terms associated with triangulation are as shown in Figure 2 and the participants’ knowledge about the same in the pre as well as post tests are expressed in percentage. The average gain score was observed to be around 52.38%.

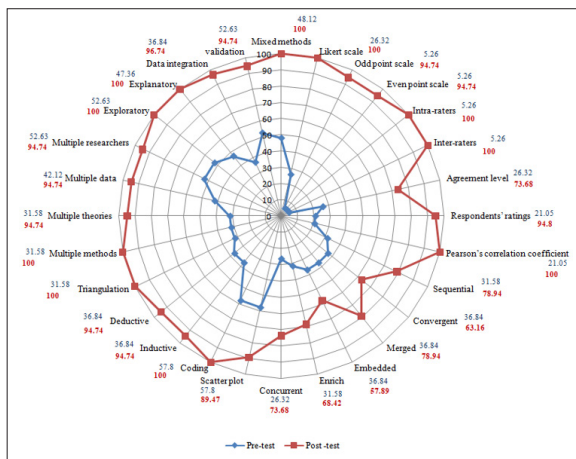


Figure 2: Responses for Various Terms Associated with Triangulation in Pre and Post Tests the ‘Framed Task’ from the participants’ perspectives

At the end of the session on the second day, the authors discussed a similar methodology adopted to assess three outcomes by three skilled assessors from the Department of Architecture with an average experience of four years on a four point Likert scale. The findings were mapped and presented so as to give an insight into the framework adopted by the authors while formulating the practicum. The rate of agreements from the participants’ perspectives on the ‘construction of knowledge’, ‘framed task’, ‘duration’, ‘presentation’ that were collected formally and informally are discussed in the following sections.

Construction of Knowledge

Cronbach alpha for 40 qualitative Likert scale-based questions was determined as 0.73. This portrays the reliability of the questionnaire that was framed to gather opinions about the sessions. It is observed that nearly 36.84% of the participants have responded to the ‘neutral’ category for the question ‘Do you have knowledge to adopt theories, postulates and ideals for assessing the outcomes of diverse basic design studios by adopting

deductive analysis?’, as displayed in Figure 3. Following this, the responses to ‘Did you get an insight into intra-raters evaluation process?’ accounted around 31.6%. Similarly, nearly 26.3% of the responses for the ‘the difference between intra-rater and inter-rater rating’, ‘basics of inductive and deductive reasoning’, ‘reasons for adopting mixed methods in triangulation’ and ‘triangulation facilitated the construction of the ‘big picture’ of the framed task in a basic design studio’ were noted to fall under the ‘neutral’ category. The responses for the other items in the questionnaire falling under both ‘strongly agree’ and ‘agree’ were observed to more than 80%.

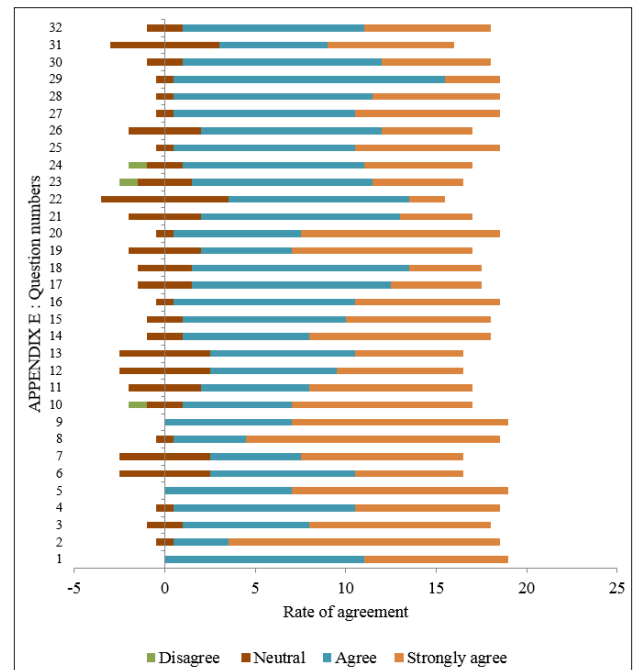


Figure 3: Likert plot for interpreting rate of agreement on the construction of knowledge

About the Framed Task

While exploring the responses addressing the ‘framed task’, around 74% agreed that the duration for performing all the activities was adequate as in Figure 4. It is observed that nearly 58% of the participants were surprised. The responses for ‘the effectiveness of the presentation’, ‘clarity in content’, ‘degree of appreciation for the framed task’ and the ‘plausibility of exploring the session as a study’ were observed to be more than 90%.

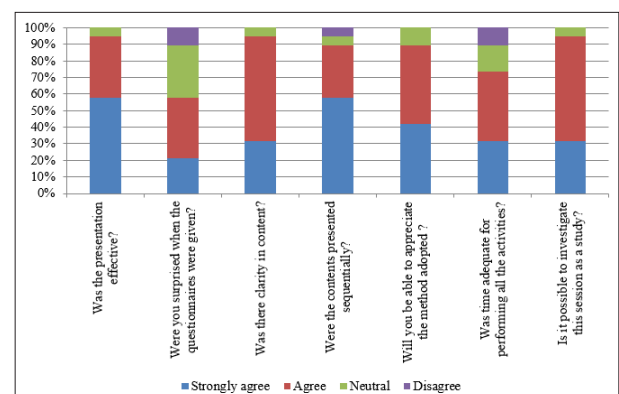


Figure 4: Rate of Agreement for Content as well as the planned activities responses Collected by COA

Nearly 94.74% of the participants observed the session and the activities to be ‘interesting’ and ‘useful’. However, only 78.95% of the participants were sure of applying in academics as in Table 4. With respect to the ‘duration of the session and tasks’, around 73.69% of the responses were noted to fall under ‘just right’ category. The participants categorized the ‘knowledge content’ and ‘interaction’ to be ‘excellent’. Similarly, 84.21% of the responses were determined to be ‘excellent’ with respect to ‘lecture delivery/ presentation/activities’ and ‘information on transfer’.

Table 4: Feedback About the Session and Framed Activities On ‘Fostering the Fundamentals of Triangulation’ Collected by COA

About the session and activities	Surely	Somewhat	Not really
Interesting	94.74	5.26	0
Useful	94.74	5.26	0
Applicability in class	78.95	21.05	0
About the duration of the session and the activities	Longer	Just right	shorter
	26.61	73.69	0
About the content, methodology adopted and transfer of knowledge	Excellent	Good	Satisfactory
Knowledge content	94.74	5.26	0
Lecture delivery / presentation/ activities	84.21	10.53	5.26
Information on transfer	84.21	10.53	5.26
Interaction	94.74	5.26	0

Informal feedbacks

When the authors enquired about the content of the sessions as well as the framed task, the participants responses such as ‘gave an insight into how to evaluate the emergent outcomes of design studios both qualitatively and quantitatively,’ ‘understood the fundamentals of triangulation,’ ‘came to know about Pearson’s correlation coefficient and how to determine and interpret the values,’ ‘unravelling a direction to mix methods,’ ‘a strategy that can be applied in any design studios.’ The participants’ responses such as ‘sessions were interested,’ ‘well thought, planned and executed,’ ‘the idea of mixing the lecture with hands on practicum was interesting and unique’ displayed that the activities were framed sequentially with clarity. Besides, ‘an insight for an inquiring mind to investigate the thesis projects,’ ‘basic idea to guide dissertation’ clearly portrayed that the participants realized the need to critically explore the quality of instruction adopted in the respective studios. The participants also enhanced the abilities to foster the students to explore and investigate specific topics at the undergraduate level.

Conclusion and Discussion

Construction of Knowledge

The knowledge constructed by the participants was measured

through pre and post-tests. The percentage of increase in the responses for the various terms listed in the pre and post tests are shown in Figure 5. It is observed that the terms like ‘convergent and embedded’ display minimum increase when the responses to the pre and post tests are taken into account. Similarly, most of the participants understood the logics behind ‘intraraters and interraters’ followed by the logics behind ‘odd and even point scales’. ‘Nearly 60 to 69.9% of the participants were aware of the words such as ‘triangulation, multiple methods and theories.’ However, the increase in the percentage responses to the word associated with mixed methods ranged from 30 to 59.9% only. A minimum gain score was observed as 7.1% for ‘convergent and embedded; enrich and scatter plot; odd point and even point scale; intraraters and interraters’. However, only 20 to 29.9% of the participants were aware of the terms such as ‘convergent, embedded’.

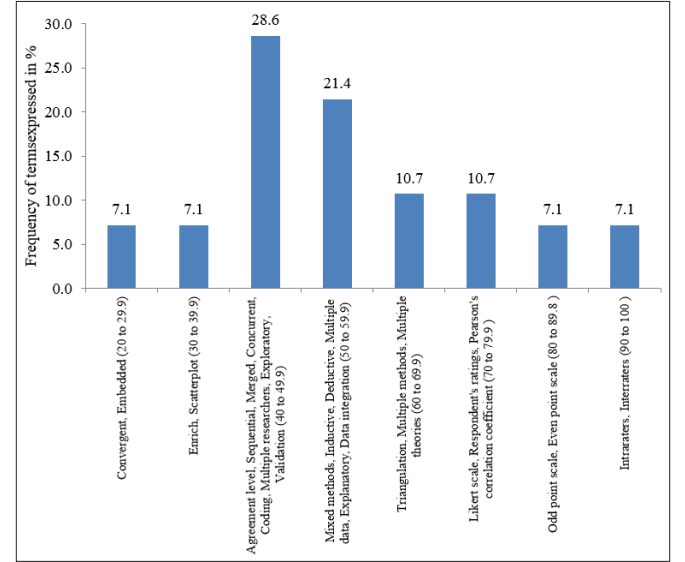


Figure 5: Percentage of Increase for the various terms listed in Pre and Post Tests

At the end of the session on the second day, the authors discussed a similar methodology adopted to assess three outcomes by three skilled assessors from the Department of Architecture with an average experience of four years on a four-point Likert scale. The findings were mapped and presented so as to give an insight to the participants about the reasons for framing such a unique task.

Completion of the Sequentially Framed Activities

When the authors analyzed the worksheets in the booklets, it was noted that all the participants completed the first two activities that revolved around the overall impression score, identification of additional parameters for analyzing the emergent outcomes collectively and the assessment of the identified parameters on a seven point Likert scale as in Table 5.

Table 5: Successful Completion of The Seven Sequentially Planned Activities

Activities	Tasks	Percentage
First	Overall impression score	100
Second & third	Evaluation of the emergent outcomes based on the parameters identified by the authors and the participants on a seven point Likert scale.	100
Fourth	Conversion of overall impression score to 7 point scale	94.74
Fifth	Calculation of Pearson's correlation coefficient	89.47
	Decoding the relationship (strong and very strong)	89.47
Sixth	Wong's two dimensional design principles	94.74
Seventh	Construction of the big picture	89.47
Average		92.76
Participants who completed all the planned activities completely		84.21

It was observed that one participant failed to convert the overall impression score from ten to seven point scale within the stipulated time. The fifth task was successfully converted by 89.47% of the participants. Around 94.74% of the participants had completed the decoding of the emergent outcomes based on the Wong's two dimensional design principles (2002). Except two participants, all the others were successful in constructing logics adopted in framing the activities as well as an insight into the evaluation process. However, it was noted that only 84.21% of the participants had completed all the activities that were planned as part of the framed task even though the average score was observed as 92.76%.

The findings obtained through various instruments are synthesized in Table 6. From the findings it is observed that the content of the lectures, methodology adopted to foster the basics of 'triangulation' and the sequential planning of activities to investigate the emergent outcomes is effective. Besides, the practicum gave an insight into systematic investigation enhancing the ability of the teachers to foster research at the undergraduate level.

Table 6: The Practicum from Diverse Perspectives

Awareness of terms associated with 'triangulation'		Pre and post tests	Average gain score is 52.38%
Content, sequential planning of activities	Structured questionnaire	authors	Around 86% of the responses were observed to fall under 'strongly agree' and 'agree' categories
		COA	>78% of the participants surely accepted the session to be interesting, useful and applicable in classes
			>84% of the participants observed the content, methodology adopted and transfer of knowledge to be excellent
	Informal feedbacks	'gave an insight into how to evaluate the emergent outcomes of design studios both qualitatively and quantitatively' 'Understood the fundamentals of triangulation' 'came to know about Pearson's correlation coefficient and how to determine and interpret the values' 'unravelling a direction to mix methods' 'A strategy that can be applied in any design studios' 'an insight for an inquiring mind to investigate the thesis projects' 'basic idea to guide dissertation'	
Completion of all the 7 activities		Around 84% of the participants completed the activities successfully	

Logic behind framing the 'Hands on Practicum'

A practicum focusing on the 'evaluation' was formulated with a focus on Maher's 'Co-evolution of problem solution model' (Maher and Poon, 1996), where the problem (P) as well as the solution (S) spaces evolve simultaneously as shown in Figure 2. The variables such as 't', 't+1' and 't+2' represent the initial, partial and developed structuring of the respective spaces.

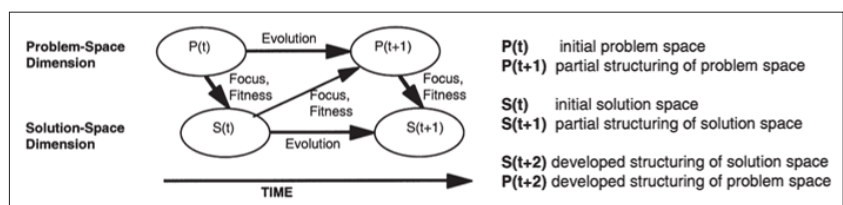


Figure 6: Maher's Co-Evolution of Problem and Solution Space

With this as the base, the authors explored a direction to formulate a ‘hands on practicum’ for the teachers of architecture in a FDP with a thrust on evaluating the emergent outcomes of a basic design task. The tasks were planned from two perspectives: a direction to foster the fundamentals of ‘methodological triangulation’ and also to examine the effectiveness of the direction adopted. This comprised of seven tasks excluding the pre and post tests. The tasks were framed cautiously to unravel a series of processes addressing ‘methodological triangulation’. In this study, the tasks were planned sequentially constructing knowledge about the probable outcomes critically incorporating both inductive as well as deductive reasoning. The authors observed that there is a need to incorporate research as well as exploration space as indicated in Table 6.

Table 6: Correlation Between Research (R), Problem (P), Exploration (E) and Solution (S) Spaces involved in the Formulation of the Practicum

Framing the ‘hands on practicum’ (Research space)											
Pre test & post tests											
Two lectures focused on ‘Fundamentals of research design,’ ‘evaluation of the emergent outcomes of an open ended task with a thrust on methodological triangulation’ were delivered											
the Framing and sequencing the activities for evaluating the emergent outcomes of a basic design task	Identification of the basic design task and the emergent outcomes										
	Worksheets were prepared in the form of a booklet for participants with the knowledge constructed through prior experimentation	Sequencing the evaluation process and formulation of worksheets (seven activities)	E(x)	First	Appendix A	S(x)	Method I				
				Second							
				Third			Method II				
			E(y)	Fourth	Appendix B			S(y)	Method III		
				Fifth							
			E(z)	Sixth	Appendix C				S(z)		
			Seventh (Solution space)	Appendix D – Triangulation							
	Framing a structured questionnaire based on five point Likert scale (Appendix E)										
	Collection of informal feedbacks										
‘x’, ‘y’ and ‘z’ represent the partial structuring of the Research (R), Problem (P), Exploration (E) and Solution (S) spaces											

With the processes adopted to frame the activities as well as process adopted to investigate the effectiveness to give an insight into ‘methodological triangulation’, Maher’s co-evolution of problem space model is modified as shown in Figure 7. In the modified model, new spaces such as the ‘research’ as well as the ‘exploration’ spaces are incorporated.

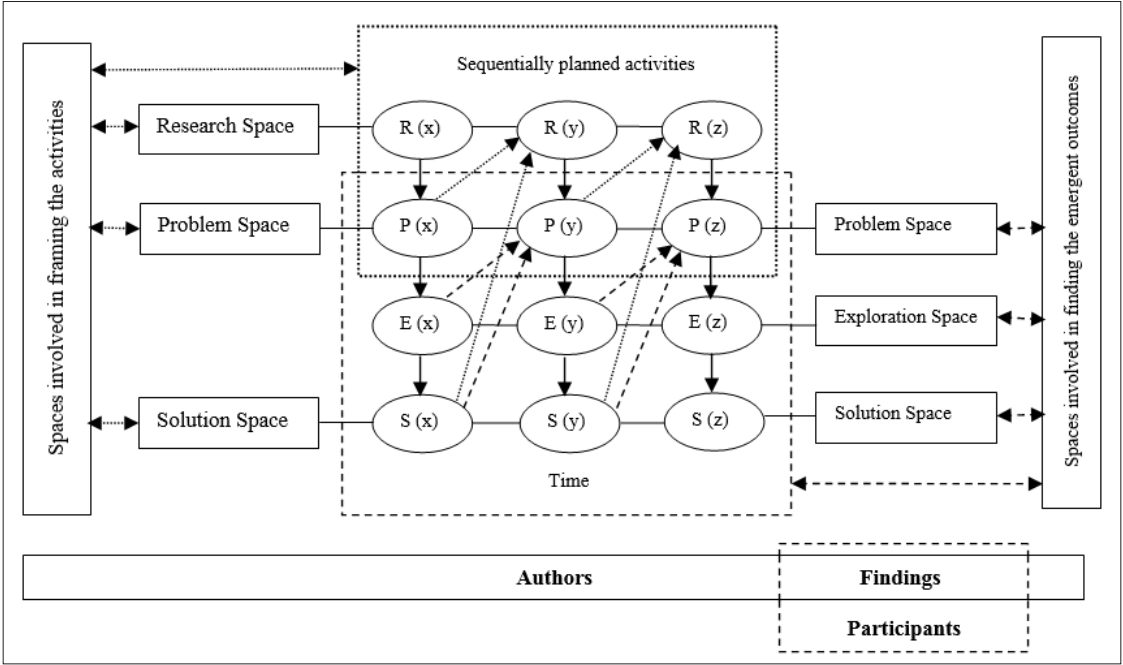


Figure 7: Modified Maher’s model to Frame Open Ended Tasks

With respect to formulation of ‘hands on practicum’ to foster the fundamentals of systematic investigation, individuals must be cautious about the various spaces such as ‘research’, ‘problem’, ‘exploration’ and ‘solution’ spaces that are involved. This methodology with appropriate variations can be adopted to investigate the emergent outcomes of basic design tasks in diverse design domains such as interior design, product design, fashion design, industrial design etc to comprehend the level of learning as well as quality of the instructions adopted in respective studios. The authors anticipate that the participants would have got an insight into the need for adopting research-based teaching to foster research at the undergraduate level. Further, this approach has the potential to be adopted to investigate the emergent outcomes of ‘cross domain creativity’ revolving around ‘architecture and fashion design’, ‘dance and architecture’, ‘music and architecture’, ‘movies and architecture’, ‘puzzles and architecture’ etc.

Appendix A: Evaluation of the Emergent Outcomes on a Ten Point Scale and the Agreement level for the Emergent Outcomes Individually

Overall impression score Overall impression score	Overall impression score (X/10)	Parameters	Unique	Very good	Good	Above average	Average	Below average	Poor
			7	6	5	4	3	2	1
Image		P1	Approach						
		P2	Composition						
		P3	Pattern						
		P4	Intricacy						
		P5	Illusion						
		P6	Colour scheme						
		P7							
		P8							
		P9							

Appendix B: Consolidation of the Overall Impression Scores and the Ratings by Each Participant for all the Emergent Outcomes for Determining Pearson’s Correlation Coefficients

Emergent outcome	P1	P2	P3	P4	P5	P6	P7	P8	P9	Overall impression score converted to a seven point scale
	Approach	Composition	Patterns	Intricacy	Colour scheme	Colour scheme				
A										
B										
C										
D										
E										
F										
G										
H										
I										
J										
K										
L										
Average score										
Pearson’s correlation coefficient (average score & Overall impression score)										Note : Highlight the boxes with more than 5 points
Very weak (0.00-0.19)										
Weak (0.20-0.39)										
Moderate (0.40 to 0.59)										
Strong (0.60-0.79)										
Very strong (0.80-1.00)										

Appendix C: Decoding the Emergent Outcomes Based on Wong’s Principles and the Parameters Having Strong and Very Strong Relationships with the Overall Impression Scores by Each Participant

Emergent outcome	Wong’s two dimension design principles (1994)				Parameters	Overall impression score converted to a seven point scale
	Variations of the basic grid	Patterns of gradation	Gradation structure	Concentration	Very strong and strong relationship with overall impression score	
A						
B						
C						
D						
E						
F						
G						
H						
I						
J						
Variations of the basic grid	Change of proportion, change of direction, sliding, curving / bending, reflecting, zigzag, further dividing, triangular grid, hexagonal grid					
Patterns of gradation	Parallel movement, concentric and zigzag movement					

Gradation structure	Anomaly (attracts attention, relieve monotony, transforms regularity, breaks down regularity
Concentration	Towards a point, away from a point, towards a line, away from a line, free concentration, over concentration, de-concentration

Appendix D: Integration of the Findings with Maximum Number of Attributes for all the Emergent Outcomes

Emergent outcome	Wong’s two dimension design principles (1994)				Parameters	Overall impression score converted to a seven point scale	NUMBER OF OBSERVED ATTRIBUTES is directly proportional to UNIQUENESS
	Variations of the basic grid	Patterns of gradation	Gradation structure	Concentration	Frequency of very strong and very strong correlations		
A							
B							
C							
D							
E							
F							
G							
H							
I							
J							

Appendix E: Methodology and Exploration in Architectural Research

Note: Tick the relevant option

CONSTRUCTION OF KNOWLEDGE						
S.No	Statements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	An insight into ‘overall impression score’ while evaluating the emergent outcomes of a basic design studio					
2.	A direction to identify various parameters associated with the framed task.					
3.	The difference between Odd and even Likert scale.					
4.	A tool to calculate the Pearson’s correlation coefficient					
5.	Knowledge to interpret the calculated coefficient					
6.	The difference between intra-rater and inter-rater rating.					
7.	Basics of inductive and deductive reasoning.					
8.	A direction to transform qualitative to quantitative data					
9	A direction to transform quantitative to qualitative data					
10.	A way to adopt multi method triangulation					
11.	An awareness to mixed methods					
12.	Reasons for adopting mixed methods in triangulation					
13.	Triangulation facilitated the construction of the ‘big picture’ of the framed task in a basic design studio.					
14.	The plausibility of extending this method to investigate the other design studios.					
15.	Were you able to follow the framed tasks effectively?					

16.	Through the framed tasks were you able to understand the basics of qualitative and quantitative scheme of evaluation?					
17.	Was the task on 'Grids' appropriate for you to understand the basics of triangulation?					
18.	Were you able to interpret the method adopted to foster the knowledge on triangulation?					
19.	Did you critically understand the process of evaluating the outcomes quantitatively?					
20.	Will you be able to identify parameters for analysing other tasks basic design studio tasks?					
21.	Is it possible to frame ways to do inductive analysis for assessing the outcomes of diverse basic design studios?					
22.	Do you have knowledge to adopt theories, postulates and ideals for assessing the outcomes of diverse basic design studios by adopting deductive analysis?					
23.	Did you construct knowledge from the sequentially framed tasks?					
24.	Will you be able to interpret the Pearson's correlation coefficient?					
25.	Did you gain knowledge to analyse the outcomes effectively?					
26.	Is it possible to for you overcome the degree of subjectivity in your own design studio?					
27.	Did you get an insight into transforming qualitative to quantitative data and the vice versa?					
28.	Did you get an insight to frame questionnaires in a study?					
29.	Were you able to interpret the logic behind the framing as well as the sequencing of the framed activities?					
30.	Is it possible for you to share the knowledge constructed with the others?					
31.	Did you get an insight into intra raters evaluation process?					
32.	Will you be able to critically analyse your scheme of evaluation adopted in design studios?					
ABOUT THE SESSION						
33.	Was the presentation effective?					
34.	Were you surprised when the questionnaires were given?					
35.	Was there clarity in content?					
36.	Were the contents presented sequentially?					
37.	Will you be able to appreciate the method adopted to share knowledge which involved the integration of tasks and sharing of the fundamentals of triangulation and mixed methods?					
38.	Was time adequate for performing all the tasks?					
39.	Is it possible to investigate this session as a study?					
Any suggestions for improvement						
Signature with name and date						

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