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Design Education for Grades 7 and 8 in a CISCE School in India — An Action Research During the COVID-19 Pandemic

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Abstract: The purpose of the research study is to apply the educational theories to improve professional practice through action research and identify the potential issues in the practice of teaching 'Design' as a subject to Grades 7 and 8. The authors have reviewed Bloom's taxonomy, Bruner's 'spiral curriculum,' Maslow's motivation theory, Vygotsky's theory of creativity, Gal'perin's learning-psychological theory and Kolb's Experiential Learning Theory, and have mapped conceptual models based on these educational theories. The conceptual models are examined in the practice of teaching design to Grades 7 and 8 in the Council for the Indian School Certificate Examinations (CISCE) curriculum in India. During these classes, the authors have collected data by direct observation, participant observation and through participatory visual research. The authors have discerned information on the pedagogy and resources for the practical implementation of the conceptual framework in conducting online classes over the zoom platform. The systematic and elaborate models presented in the paper can be adapted and examined through further research and practice, both in physical and offline classes. The findings and the field work presented in the paper must be understood as theoretical and practical guidance that can be adopted and operationalised in educational practice.

Keywords: School, Design Education, Educational Theories, Conceptual Model, Action Research, Online

1. Introduction

The recent COVID-19 pandemic has caused substantial transformational changes in the field of education across the globe. The nature of schooling, communication, and interaction has changed fundamentally under these circumstances and has challenged the teaching community to create stronger relationships between theory and practice, devise appropriate and continuous ways of learning and enhancing the capacity in learning to learn. It is crucial to reconsider the teaching-learning approaches for educating the 21st century learners because students are expected not only to acquire knowledge, but to also have the ability to apply it in various real-life situations.

In this paper, conceptual maps and frameworks regarding the knowledge and skills required in basic design education are examined by the authors through their design practice at a Council for the Indian School Certificate Examinations (CISCE) School in India. The scope of the research is limited to CISCE Board, at middle school level in India. Based on the learning theories in education, especially Kolb's experiential Learning Theory [1], the authors use the explicit processes in design to conduct online classes and give assignments to the students. The authors assess the students for learning through the explicit and tacit experiences in these design classes.

Through this practice, the authors have intended to do a reality check and establish facts and relationships in formal design education in Grades 7 and 8. The authors have discerned information on pedagogy and resources for the practical implementation of the conceptual framework through the process of conducting online classes over the zoom platform. The classes are planned in such a way that they provide the collected experience of material and handcraft culture through design processes in basic school education. The study conducted has shown that in introducing

design education in the school, it has come into the formal structure and hence in the curriculum by default. This research study has adopted a research and development approach to one's own teaching in the Indian school context, to bridge the gap between the theories/ ideas (educational intentions) and the attempts to operationalize them (educational realities) in practice (Figure 1). By Indian context, the author implies the curriculum, the available infrastructure, materials, tools and machinery in the school and the prevalent art and craft techniques in the region.

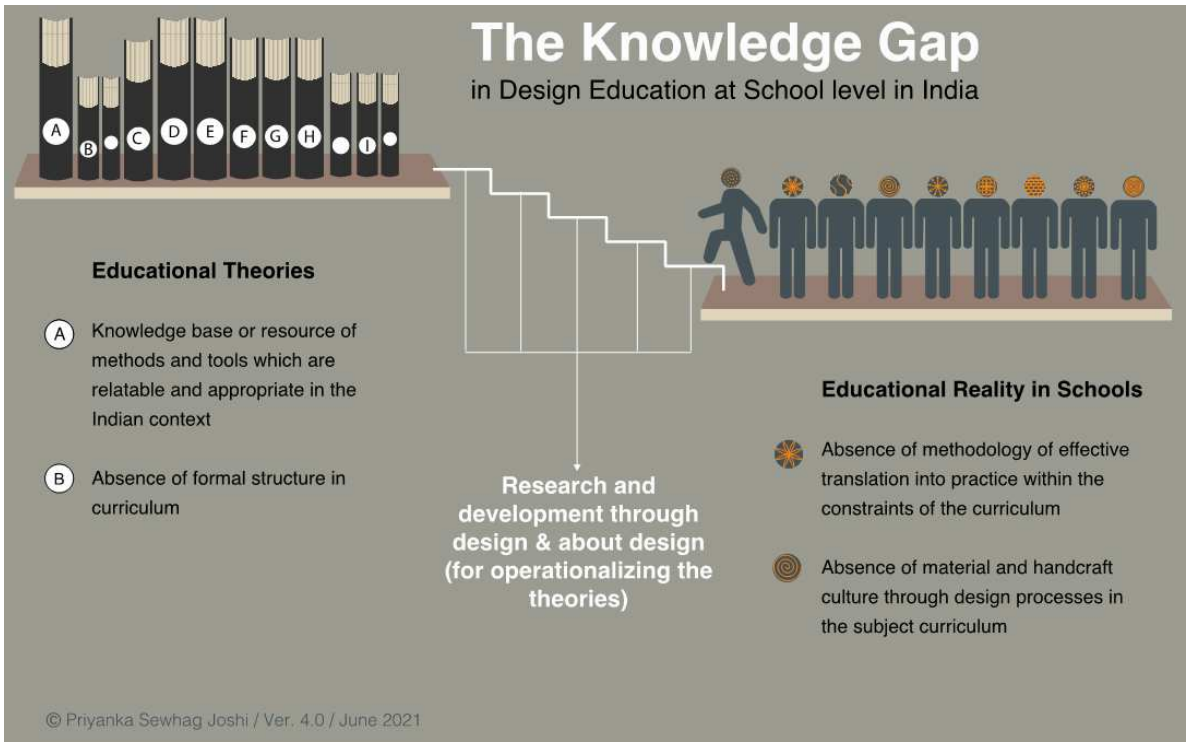

Figure 1. *The knowledge gap in Design education at school level in India.*

2. Methodology

2.1. Data Collection by Action Research

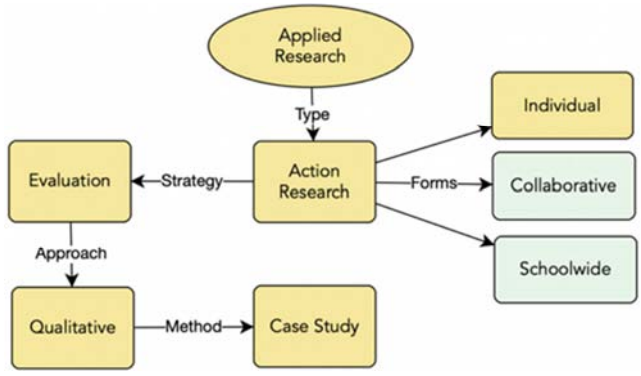

Figure 2. *An Overview of the Research Methodology.*

The purpose of the research study is to apply the educational theories to improve professional practice through qualitative research. Therefore, the first author has conducted Action research for this study. The authors have engaged in evaluation research to assess the methods of teaching and the instructional materials, to enable them to make informed decisions about the future course of action in this field. The authors believe that evaluation research will serve the purpose of identifying the potential problems and issues in the practice of teaching 'Design' as a subject to Grades 7 and 8. The authors have utilized the qualitative approach to inquiry through online classes for Grades 7 and 8 using the 'Case study' method.

The action research (Figure 2) has allowed the educators to investigate areas of concern in their classrooms and school [2]. The first author has conducted an 'individual' action research as the teacher and has focused on a Grades 7 and 8, for design education as a subject, during the academic hours of the school. Since the authors are design educators, they have the necessary knowledge and skills, and the desire to carry out action research in field of design education.

Prior to the classes, the authors have made lesson plans and prepared material for the class after analyzing existing concept maps and reviewing relevant literature. The authors have set the assessment criteria for the assignments given to the students based on their literature review. The online classes are conducted by the first author through zoom meetings of 40 minutes for a sample of students (chosen randomly) from Grade 7 and Grade 8 (separate classes have been taken to give inputs). The first author has collected data using the following methods of qualitative research [17]:

1. By direct observation—observing the students without interfering and making systematic and regular observations.

2. As a participant observer by observing the students' responses and recording them systematically and regularly.
3. Through participatory visual research where the student participants have created and provided images and other visual sources.

2.2. Data Analysis

The authors have analyzed the data through the recorded zoom classes. The data analysis is carried out systematically by the first author in the following manner:

1. A systematic literature review, analysis, and organization of relevant data, for lesson planning and implementation.
2. Categorization of data.
3. Interpretation of instances.
4. Synthesis of findings.

2.2.1. Framework for Analysis

The emphasis on students' participation in the specifically designed learning activities with material and social resources, has methodological implications for educational research and thus has shifted the focus on the analysis of the following categories:

1. Design and structure of the learning activities [13].
2. Students' responses—actions as active participants in the learning process and their interactions with the available material and social resources.
3. Implications of translation of the theoretical model into practice.

2.2.2. Pedagogic Framework

The purpose of the Action Research is to provide concrete strategies and techniques [2] to impart design education for Grades 7 and 8 in school. The pedagogical approach of the author is the 'flipped classroom'[1] method [3] though online classes for the research study. Students in the flipped classroom are required to watch the videos and are given reading material before class. The material given to them before class is discussed during class time and student learning is led by scaffolding. Assessment criteria is set to let the students be aware of the learning expectations.

3. Theories of Learning in Education

The authors have reviewed theories in education to apply them in the learning planning and teaching strategy.

3.1. Bloom's Taxonomy

In educational learning, instructional designers and educators often refer to the three categories (KSA) as Knowledge (cognitive), Skills (psychomotor), and Attitudes (affective) [4]. Cognitive Learning refers to facts, concepts, processes, procedures, principles, and metacognition [5]. The psychomotor domain deals with learning through guided response, which is achieved by practice and experience, so that the learner is in readiness to act. The author intends to acquaint the students with the design process, principles and design thinking through exercises and tasks for cognitive development. The necessary handcrafting skills are developed through instruction and guidance by the teacher. The values or attitude refer to the approach developed as an outcome of the learning process.

3.2. Bruner's Theory of Cognitive Development

Bruner's learning theory suggests that introduction of a new material is followed by a progression from action-based enactive representation (doing) to image-based iconic representation (conception) to symbolic representation [6] (language-based operations by means of description). This cognitive development of the child is a response to influences from the environment, particularly the 'school environment' [8]. Bruner's work suggests that a learner, starting from a very young age can learn any material so long as the instruction is organized 'systematically' [7] together with practice and experience. For Bruner, the purpose of education is not to impart knowledge, but instead to facilitate a child's thinking and 'problem-solving' skills through 'extensive training,' [7] so that they can then be applied to a range of situations. Bruner explains that this is possible through the concept of the 'spiral curriculum' [8] which involves information being structured so that the complex ideas can be taught from a simplified level to more complex levels later. Bruner proposes that learners' construct their own knowledge by discovery learning (also known as a constructivist approach). The author plans to design lessons that help students discover the relationship between fragments of information collected through research and utilize skills acquired through prior training. The development of the image modes of cognition is particularly relevant in design when it comes to conceptualization. In Bruner's 'continuous' theory of cognitive development, design education provides opportunities particularly for the development of the visual or the iconic modes that can be applied to create visual or tangible forms.

3.3. Maslow's Motivation Theory

Maslow's motivation theory indicates that learning is most effective when it is contextual. All human behavior is motivated, and all learning involves reward and is goal directed [8]. The learner's cognition, visualization and concrete activities are led by past experiences and the contextual environment. The author intends to facilitate concrete activities in a contextual environment in terms of material and social resources. The motivation for the students is generated by facilitating a reward through competition.

3.4. Vygotsky's Theory of Creativity and Zone of Proximal Development

Context dependent and embodied nature of creative learning aligns with what Vygotsky recognized as socially constructed and environmentally situated knowledge [9].

1 Teaching based on a "flipped classroom" approach occurs when students conduct significant pre-class preparation, including watching prerecorded lectures, while traditional class time is reserved for discussion (Tune, Sturek, and Basile 2013).

Vygotsky's cycle of creative imagination describes a transformative process of consciously extracting selected fragments from a conscious experience of reality, and using imagination to adapt, develop and translate these fragmentary perceptions into new ideas and interpretations [9]. Building on this principle, Vygotsky advocates a theory of teacher assisted learning or 'scaffolding', where students under adult guidance or in collaboration with more capable peers can achieve the level of potential development through problem solving [10]. Further, Vygotsky calls the gap between what a learner has already mastered (actual level of development) and what he or she can achieve when provided with educational support (potential development), the zone of proximal development (ZPD) [10]. Vygotsky's zone of proximal development contains those functions that are not yet ripe but are still in a process of maturation. He says that learning in the zone of proximal development makes a necessary contribution to cognitive development. The author records that 'collaboration' and 'scaffolding' tools may be applied during the teaching-learning activity to develop creative potential through design education.

3.5. Gal'perin's Learning–Psychological Theory

The formative role of education is significant in Vygotsky's notion of a zone of proximal development (ZPD). Vygotsky explained the primary role of a practical activity in the development of human consciousness, but his focus was on investigating the role of tools (material and conceptual), while Gal'perin extended Vygotsky's zone by including the role of the activity that employed these tools and a teaching–learning model of the formation of mental actions [11]. The author's compare Gal'perin's theory of the stepwise formation of mental actions to the 'Design process'— the child can visualize and communicate, perform the activity with the images of the material or materialized objects mentally when the action is first carried out with concrete objects using material (physical objects) or materialized actions (using models, simulations, animations, schemes, etc.) [12]. In both cases, the cultural tools and social interaction are key factors contributing to the learning and the psychological processes.

Gal'perin's model outlines steps in the teaching–learning process, formulates a set of conditions for the development of mental actions and describes the teacher's role. Galperin identifies that a learning activity comprises of three parts: orienting, executive and controlling. Orientation (Figure 3) is of particular significance in any learning activity, requiring careful planning to foster 'dialogical thinking' [13] in the students' minds. The teacher must design the structure of the learning activities such that they are able to enhance the learners' capacities. The teacher must facilitate both material and social support resources and a system of conditions under which students cannot avoid mastering the action and in doing so, the students will learn how to complete other tasks. This will develop not only conceptual understanding of the curriculum but also contribute to understanding the development of the learners across various contexts and subject domains [12]. With scaffolding, Gal'perin suggests that learning happens quickly, with minimum mistakes and the skills formed during this activity can be transferred to other learning situations.

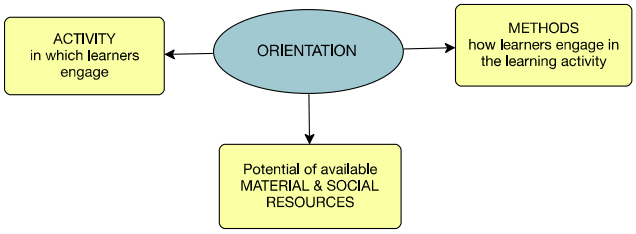

Figure 3. *Gal'perin's Conceptualization of orientation for a learning activity.*

From the perspective of Galperin's pedagogical theory, the following design principles (DP) [13] for classroom activities and digital environments are reviewed by the authors (Figure 4):

DP1: Identify the target concept and the structural parts of it in a sequential order (with the help of students' prior knowledge and skills).

DP2: Learning orientation: Complete and created by students by using an offered approach.

DP3: The Design Process to enhance students' understanding of the learning process they are engaged in.

DP4: Material and social support resources to assist the development of learners' conceptual understanding (materialized action—communicated thinking—dialogical thinking—acting mentally).

DP5: Presentation—communicated thinking, create the premises for social interactions.

DP6: The role of teacher—facilitate the learning process and give feedback to develop students' conceptual understanding and enhance students' understanding about how to go about learning.

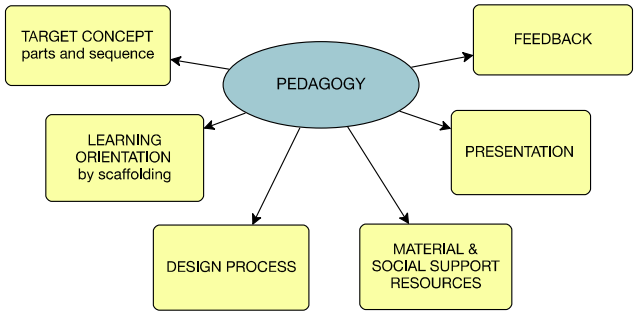

Figure 4. *Gal'perin's conceptualization of pedagogy for a learning activity.*

Galperin's conceptual contribution may therefore have significant implications in educating the 21st century learners so that they possess the capacity to meaningfully respond to the challenges and transform the world.

3.6. Kolb's Experiential Learning Cycle

To understand the learning activity, the authors review Kolb's Experiential Learning Theory (ELT) [3] where learning occurs from experiences in four stages (Figure 5), the authors have used Kolb's experiential learning cycle to develop their

lesson plans within which the learning would take place. Kolb's learning cycle in Stage 1 involves doing and thinking to provide a 'concrete experience,' Stage 2 involves learning from mistakes, reflection or thinking of the situation or the problem for a solution though 'reflective observation,' Stage 3 involves application of principles and ideas through 'abstract conceptualization,' and Stage 4 involves putting these concepts into practice through 'active experimentation.' The core of Kolb's four-stage model is a simple description of the learning cycle which shows how experience is translated through reflection into concepts, which in turn are used as guides for active experimentation and the choice of new experiences. The cycle may be entered at any point, but the stages should be followed in sequence. The learning cycle thus provides feedback, which is the basis for the next cycle of action and evaluation of the consequences of that action. The learning cycle is 'a spiral of action' [14] as learners should go through the cycle several times.

3.7. Emerging Themes

Gibbs recommends that to learn effectively from experience, it is necessary to utilize the abilities associated with each of the four learning styles as mapped in Figure 5. The authors have mapped the basic design abilities — design knowledge and skills associated with each stage of Kolb's experiential learning cycle in Figure 6. These design abilities can be nurtured if the teacher adapts and operates in the teaching-learning style appropriate to each successive stage of the experiential learning cycle, at different stages in a learning task.

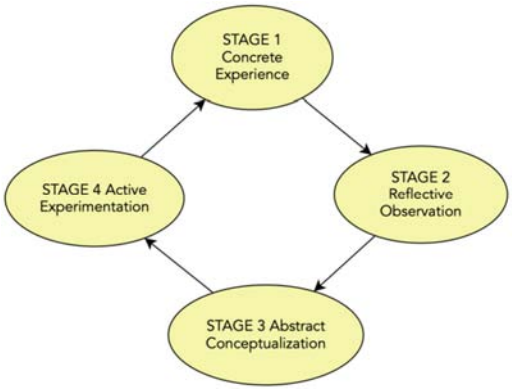

Figure 5. *Kolb's Experiential Learning Cycle.*

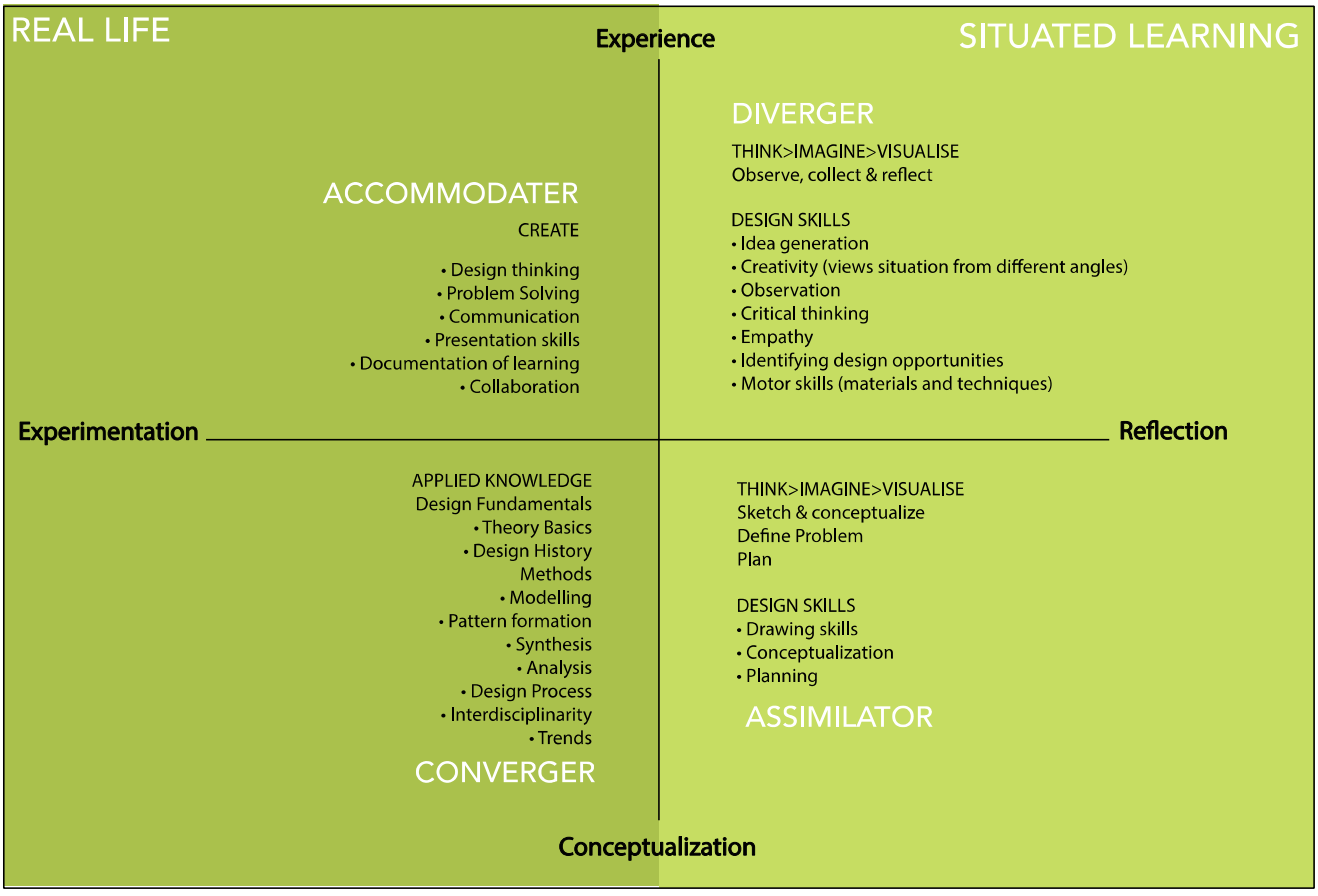

Figure 6. *Design Abilities based on Kolb's Learning Style Inventory (LSI).*

Kolb identifies four learning styles and the authors have identified their equivalents in design (Figure 6); each is associated with a different way of solving problems:

1. Divergers view situations from many perspectives and rely heavily upon brainstorming and generation of ideas.
2. Assimilators use inductive reasoning and can define and

create theoretical models.

3. Convergers use hypothetical-deductive reasoning and apply prior subject knowledge.

4. Accommodators carry out plans and adapt to immediate circumstances for an appropriate resolution.

The choice of learning style reflects the individual's abilities, environment and learning history. According to Kolb, learners learn better when the subject matter is presented in a style consistent with their preferred learning style [14].

The teacher's role is a patterned set of behaviors that emerge in response to the learning environment, including students and the learning task demands [15]. Each teaching role engages students to learn in a unique manner, using one mode of grasping experience and one mode of transforming experience. In the 'Learning Facilitator's' [18] role, the teacher draws on the modes of concrete experience to help learners acquire design knowledge and skills through material craft culture to serve indigenous needs through indigenous solutions. The modes of concrete experience are the tools, resource people and provisions essential for the design activity to take place. The 'Careful Gardner' [18] draws on reflective observation to cultivate self-realization in the learners, build on the knowledge base of the subject matter and help achieve the best of the learner's potential. The 'Learning Content Designer' [18] uses abstract conceptualization to foster design thinking and familiarization to one's culture. The 'Learning Coach' [18] draws on active experimentation and concrete experience to propel learners to apply knowledge and skill towards performance goals. In this role, teachers closely monitor the quality of student performance towards the standards they have set and provide consistent feedback [15]. These roles can also be organized by their relative focus on the learner versus the subject, and action versus knowledge as mapped in Figure 7.

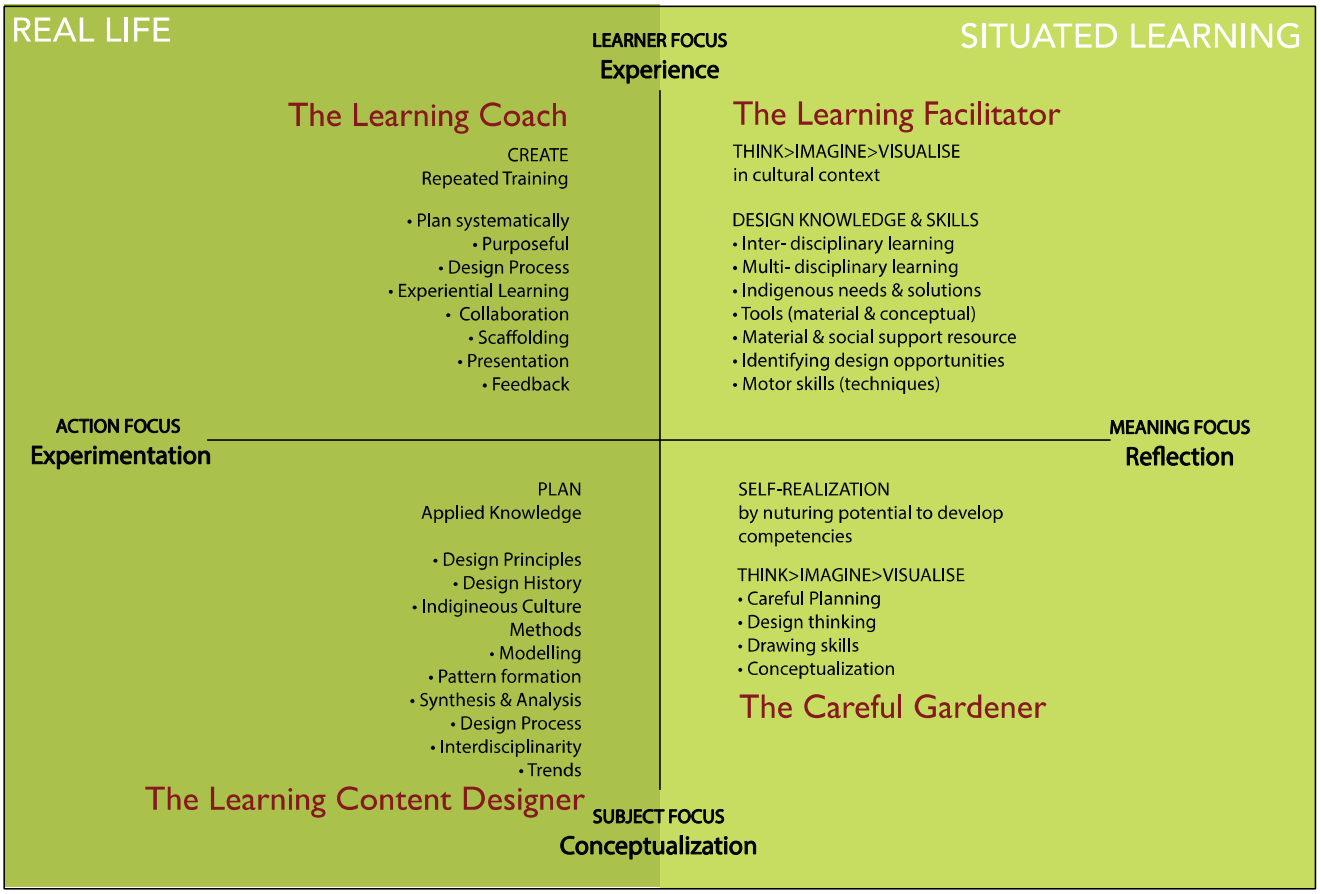

Figure 7. *Design Educators Role based on Kolb's ELT.*

4. Case Study

4.1. Lesson Planning

Based on Figures 6 & 7, the authors have prepared a unit lesson plan (40 minutes X 4 classes) for Grades 7 & 8. The lesson has been planned, keeping the physical and material limitations of online class transaction in mind, due to the COVID-19 pandemic. The authors have planned the sequence of learning activities for the lesson based on the stages of Kolb's ELT.

Planning for the assignment 'Designing for the reuse of a bottle' was done as in the following manner:

Stage 1: Concrete Experience: Doing Craftwork on bottle (online demonstration through video)

Stage 2: Reflective Observation: Discussion on reuse of bottle and understanding the term 'Design' and 'Design Process.'

Stage 3: Abstract Conceptualization: Research & design thinking for reuse and recycling of the bottle.

Stage 4: Active Experimentation: Planning in detail and creating a product to serve a purpose.

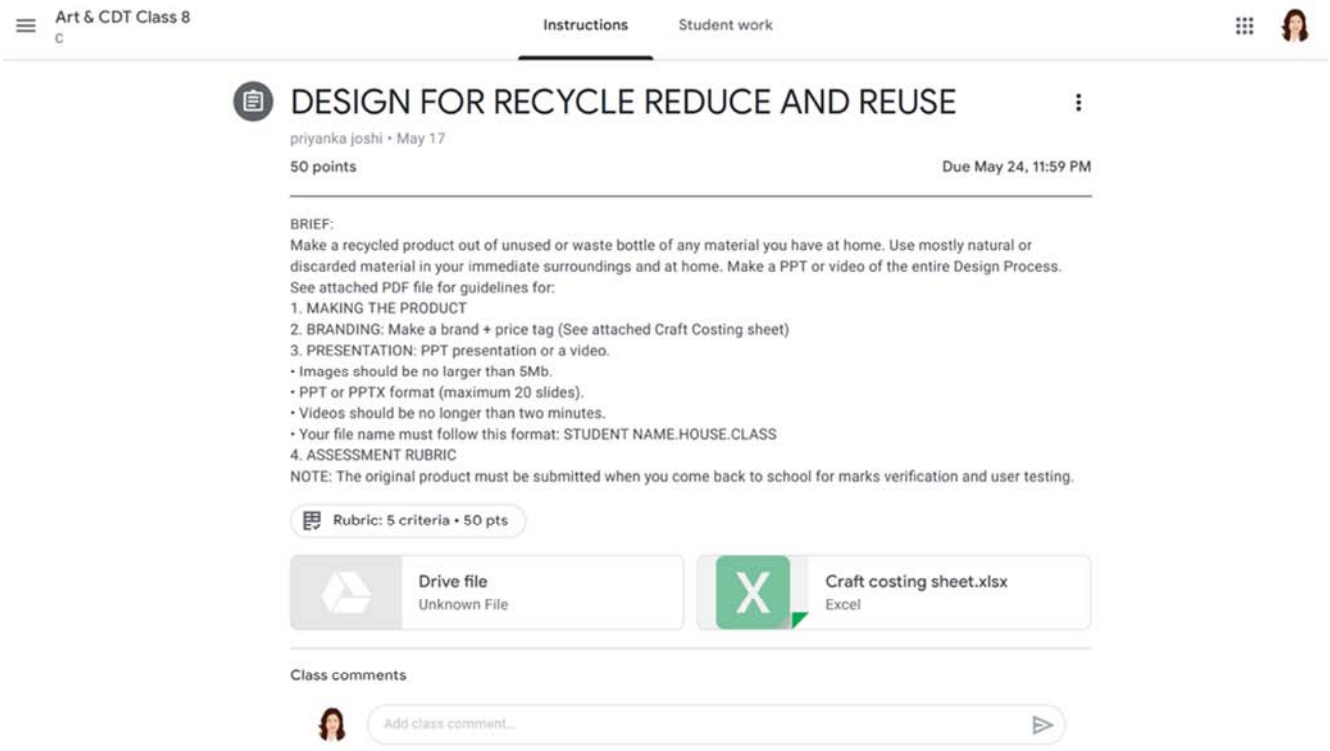

Figure 8. *Instructional Material posted in the Google classroom.*

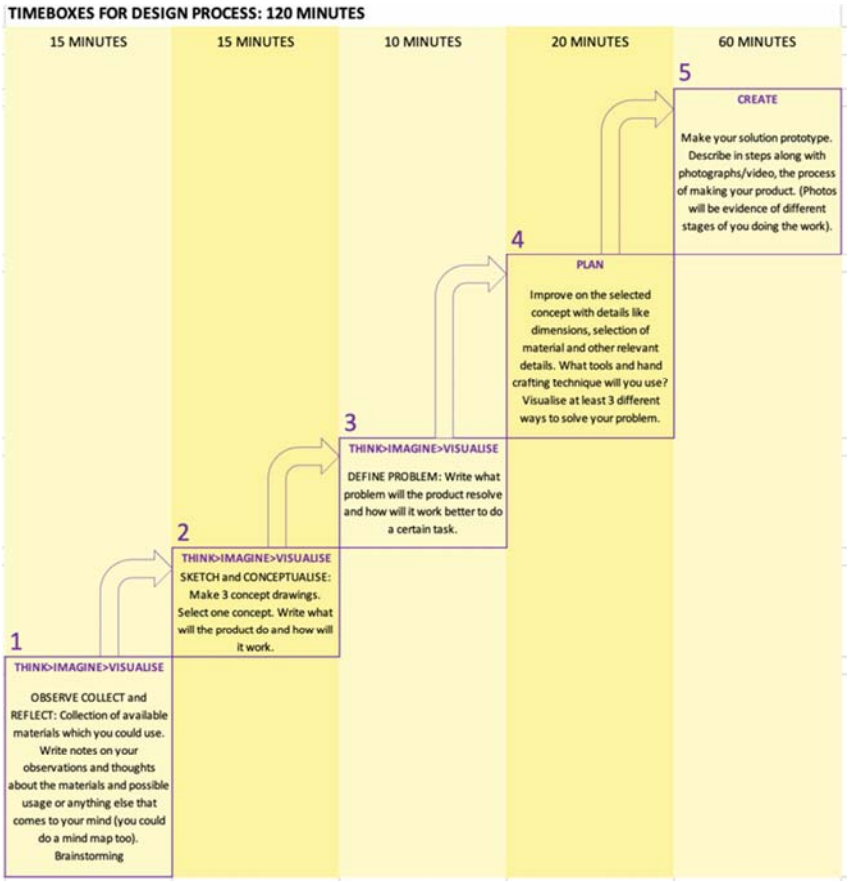

Figure 9. *Instructional Material for 'Making the Product' posted in the Google classroom [16].*

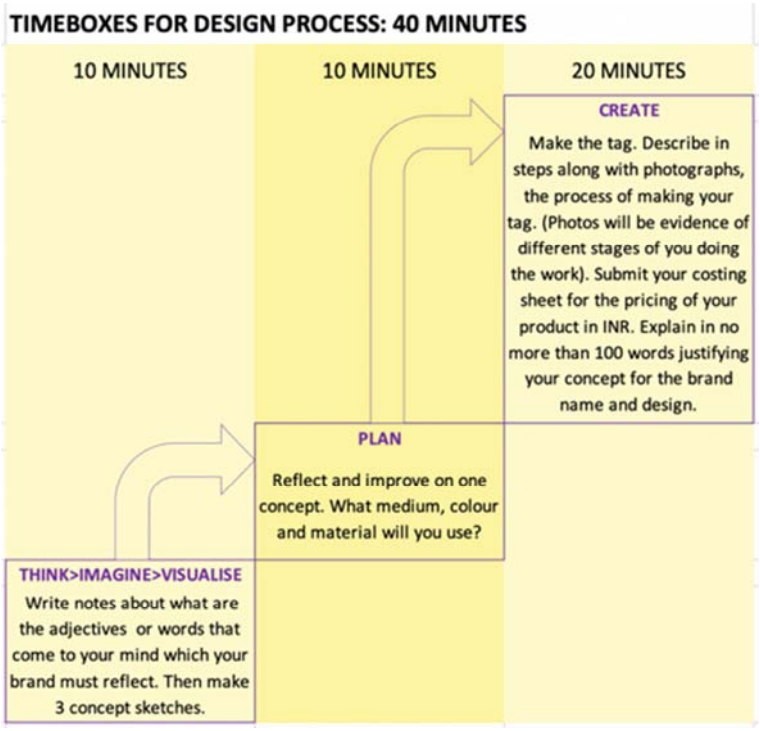

Figure 10. *Instructional Material for 'Branding' posted in the Google classroom.*

COSTING FOR CRAFT PRODUCT

Sl. No	Particular of cost	Limitation	Rate per unit	Size/ Quantity used
1	Main Material Cost (Like wood/Bamboo/ cardboard/ rope/ Mseal etc. including cutting waste)	Actual		
2	Processing (If any chemical treatment is done)	Actual		
3	Fixing Tools/ material cost (Like Nail, Glue, instrument)	Actual		
4	Finishing work cost (Hot air burning, Kerosene Oil and sand paper etc.)	Actual		
5	Polishing (Varnish)	Actual		
6	Packaging cost (If any)	Actual		
7	Making cost (Hardwork)	Actual		
8	15% Overhead (For maintance of Tools and Machinery Depreciation)	15% of total material cost (SL. NO 1)		
9	Transportation/ Vehical/ Petrol cost	5% on total material cost (SL. NO 1)		
10	Production cost (Stationary - pencil, paper, eraser)	Actual		
	TOTAL COST (up to two decimal places)			**Rs.**

Note: Rate *is for example- Rs 20.00 per kg or gram, Rs 12.30 per meter etc.*

Figure 11. *Instructional Material for 'Costing' posted in the Google classroom.*

An assignment was posted with guidelines for the design process, time management and costing, in the Google classroom one day before the class (Figures 8, 9, 10, 11 and 12). The students were asked to go through the instructional material before the class and discuss the same in the online class. The teacher would explain the concepts and instructions the students did not understand on their own, during class time. The instruction was planned so that the ELT cycle was repeated at least twice to complete the assignment, once to design a product and second time to do branding for the product made by the student, as shown below:

Stage 1: Concrete Experience: Costing activity (Costing sheet is provided and explained).

Stage 2: Reflective Observation: Thinking of a Brand name and making a price tag is discussed with a few examples.

Stage 3: Abstract Conceptualization: Research and

conceptualization for Brand name and price tag.

Stage 4: Active Experimentation: Creating the Brand and Cost tag for the product.

The assessment rubric (Figure 12) is based on the design principles from Gal'perin's conceptualization of pedagogy for a learning activity (Figure 4).

DP1: Target concept (parts and sequence) > Knowing & understanding (KU). It includes concept sketching.

DP2: Learning orientation (scaffolding) > Visualization and Planning (VP). It includes imagination and newness.

DP3: The Design Process > Applied Creativity. It includes the process.

DP4: Material and social resources > Skill development

DP5: Presentation > Communication by Presentation

ASSESSMENT RUBRIC: 50 MARKS

Knowing and Understanding: 1, 2, 3					
	10	8	6	4	2
	Excellent	Very good	Good	Satisfactory	Insufficient
Visualisation and Planning: 4					
	10	8	6	4	2
	Excellent	Very good	Good	Satisfactory	Insufficient
Applied Creativity: 5					
	10	8	6	4	2
	Excellent	Very good	Good	Satisfactory	Insufficient
Skill Development: 2, 4, 5					
	10	8	6	4	2
	Excellent	Very good	Good	Satisfactory	Insufficient
Communication by Presentation: 5					
	10	8	6	4	2
	Excellent	Very good	Good	Satisfactory	Insufficient

Figure 12. *Assessment Rubric posted in the Google classroom.*

4.2. Online Classes

The authors have designed the classroom teaching to be situated in a contextual environment since it is a crucial factor in the sustainability and relatability of design as a subject, and to also serve the purpose of design thinking. In the current scenario of online classes during the COVID-19 pandemic, the situation has been based on recycling of materials and tools available at home, during lockdown. For skill upgradation in handcrafting a product, a virtual library is made available to the new students by posting video links from the internet, or they have recalled the skills learnt while attending physical classes at school earlier. A zoom class is conducted by the first author on the ZOOM platform during the academic hours as per the timetable for a period of 40 minutes. The class is attended by 23 students of Grade 7 and 22 students of Grade 8 on different days.

The students' responses have been recorded by the teacher.

4.2.1. Direct Observations

The teacher's direct observations have been:

Grade 7:

1. 5 minutes of the class time went in resolving technical issues.
2. The students did not understand the assignment by going through the reading material posted in the google classroom a day before the class, as the topic was introduced to them for the first time.
3. The students said that they faced limitations of availability of materials.
4. The students were attentive and interactive throughout the class.
5. One of the students kept on asking about the marks she can get and was not listening to what the teacher was saying.
6. The teacher emphasized the significance of the design process rather than the product.
7. The orientation class was 40 minutes and the working time for the assignment was 120 minutes.

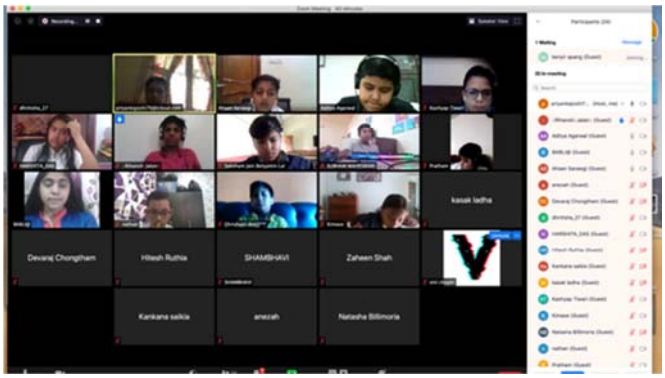

Figure 13. *Zoom class for Grade 7.*

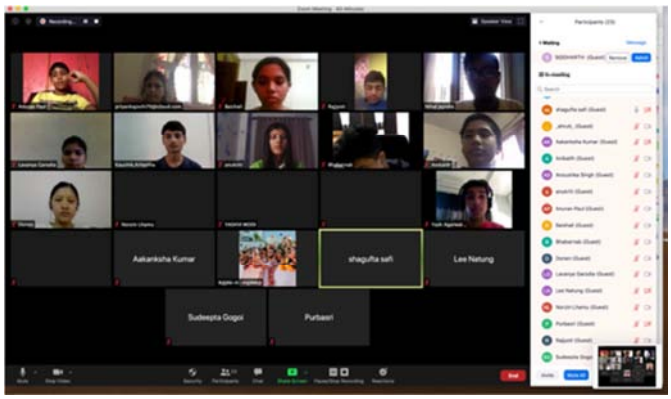

Figure 14. *Zoom class for Grade 8.*

Grade 8:

1. For Grade 8, there were fewer queries.
2. The class was less interactive than Grade 7.
3. The students said that they faced limitations of availability of materials.
4. The teacher explained the term 'Design' and 'applied creativity' elaborately because the students understand design as 'decorative art.'
5. The teacher stressed on terms like 'usefulness,' 'man-made,' visual and tangible,' and emphasized on the thinking steps of the design process.

4.2.2. Participant Observations

The teacher as a participant has observed that:

Grade7:

1. The students joined the class eagerly in anticipation of

what they would discuss in class regarding the new material that was posted in the class a day earlier. They had many queries.

2. During the class discussions, the students had queries regarding the assessment criteria terms like 'knowing and understanding,' 'visualization and applied creativity.' The author as the teacher explained what was expected from each of the assessment criteria.
3. The teacher explained in detail the process of doing the assignment. The explanation began with the difference between the term 'design' and 'decoration.'
4. The assignment was clear after discussion and the students could grasp the concepts and the process quickly because they had read the material before coming to class.
5. The students got distracted when there was a long monologue from the teacher's side.
6. There should have been more interaction between the teacher and the student. More techniques of evoking students' response need to be investigated by the teacher.

Grade 8:

1. The response to idea generation was notable for class 8.
2. Upon reflection, the authors have decided to show some design case studies to the students in future, for a better understanding of design thinking.
3. Class discussion led to the question that are design and technology the same thing? Many students linked design to robotics and computer programming.
4. The students had to be made aware of cost-effectiveness and practicality aspect of the product.
5. Creativity and applied creativity, both were not conceptually clear to the students in the beginning and because of limited class time it could not be verified how many of them understood the concept.

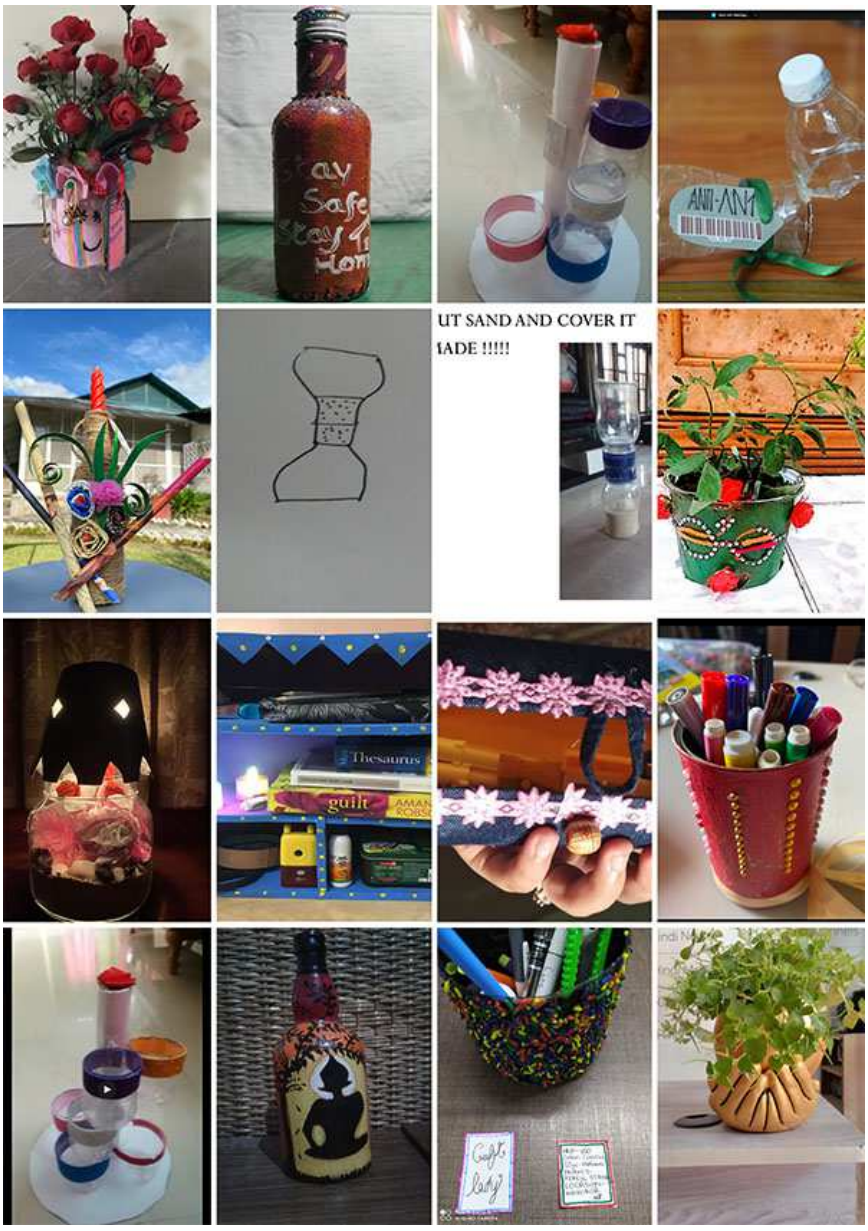

Figure 15. *Images of Assignment Submissions by Grade 8.*

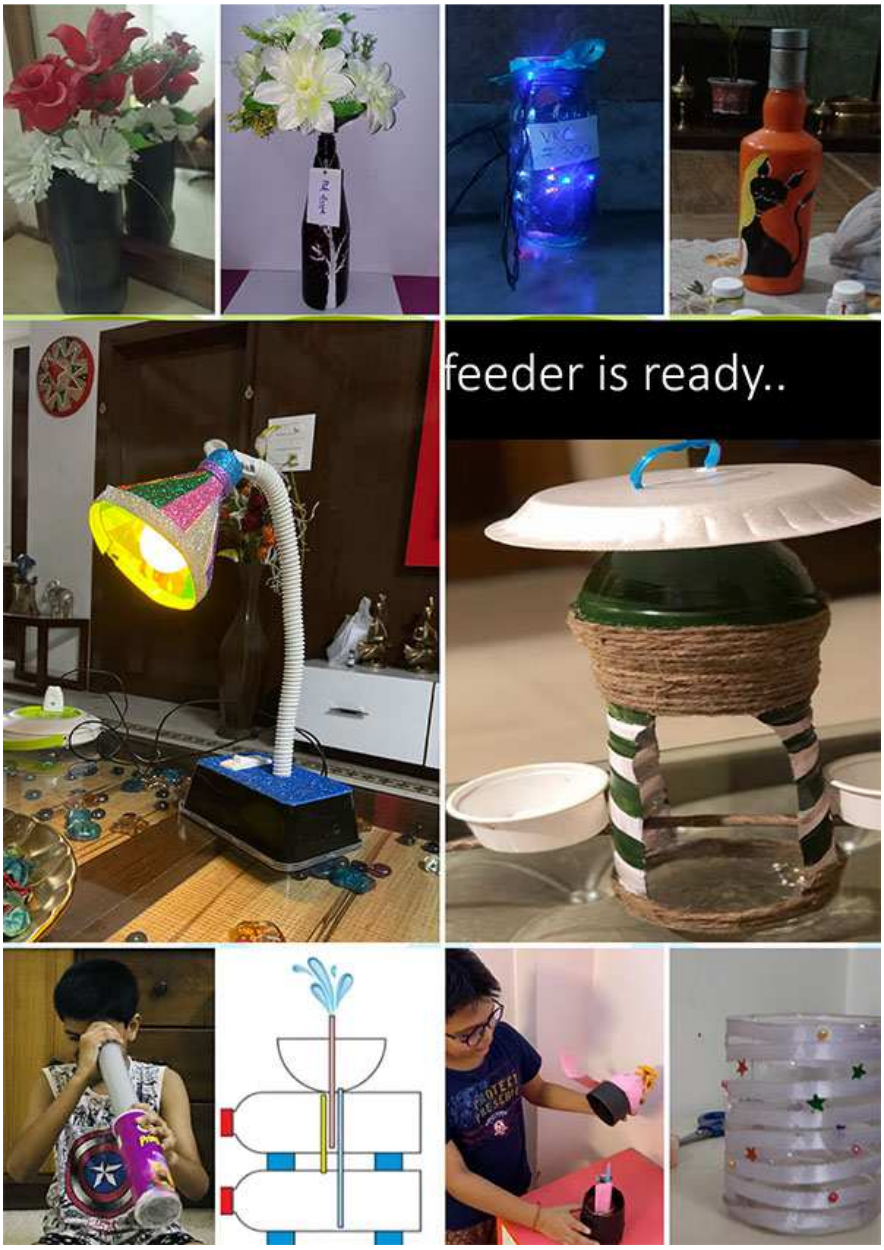

Figure 16. *Images of Assignment Submissions by Grade 7.*

Table 1. *Assessment for Assignment Design for Recycle & Reuse.*

KU7	KU8	VP7	VP8	AC7	AC8	SD7	SD8	CP7	CP8
10	10	4	10	10	10	10	10	10	10
6	2	6	10	10	10	8	8	6	10
6	2	2	10	8	10	8	10	4	6
8	2	4	10	10	10	10	10	4	10
10	10	10	10	10	10	10	10	10	10
8	2	8	10	8	8	8	8	10	8
6	10	4	10	6	10	8	10	8	10
8	2	8	10	8	10	8	8	8	10
10	2	2	10	10	8	10	10	10	8
6	6	2	0	8	2	10	4	8	4
8	2	7	10	8	10	7	10	5	8
8	2	6	8	10	10	10	10	10	10
10	2	6	10	10	10	8	10	10	6
4	2	6	10	8	10	4	10	5	6
8	6	5	10	9	10	9	10	8	10
8	4	5	8	9	8	9	8	8	8
7.75	4.125	5.3125	9.125	8.875	9.125	8.5625	9.125	7.75	8.375

4.2.3. Participatory Visual Research

To highlight the implications of translation of the theoretical model into practice, Table 1 gives us a measure based on the Assessment Rubric, for 16 students each of Grade 7 and Grade 8 who submitted their assignment:

Grade 7 Mean Values:

Knowing and Understanding (KU7): 7.75
Visualization and Planning (VP7): 5.31
Applied Creativity (AC7): 8.88
Skill Development (SD7): 8.56
Communication by Presentation (CP7): 7.75

Grade 8 Mean Values:

Knowing and Understanding (KU8): 4.13
Visualization and Planning (VP8): 9.13
Applied Creativity (AC8): 9.13
Skill Development (SD8): 9.13
Communication by Presentation (CP7): 8.38

The interpretation of the data visualizations indicates that:

DP1: KU > Target concept (parts and sequence) > Most of the Grade 7 students made the concept sketches whereas Grade 8 students built on one concept from the beginning and focused on the product rather than knowing and understanding the process of design thinking. Grade 7 students were consistent on exploring more ideas right from the beginning (Figure 17).

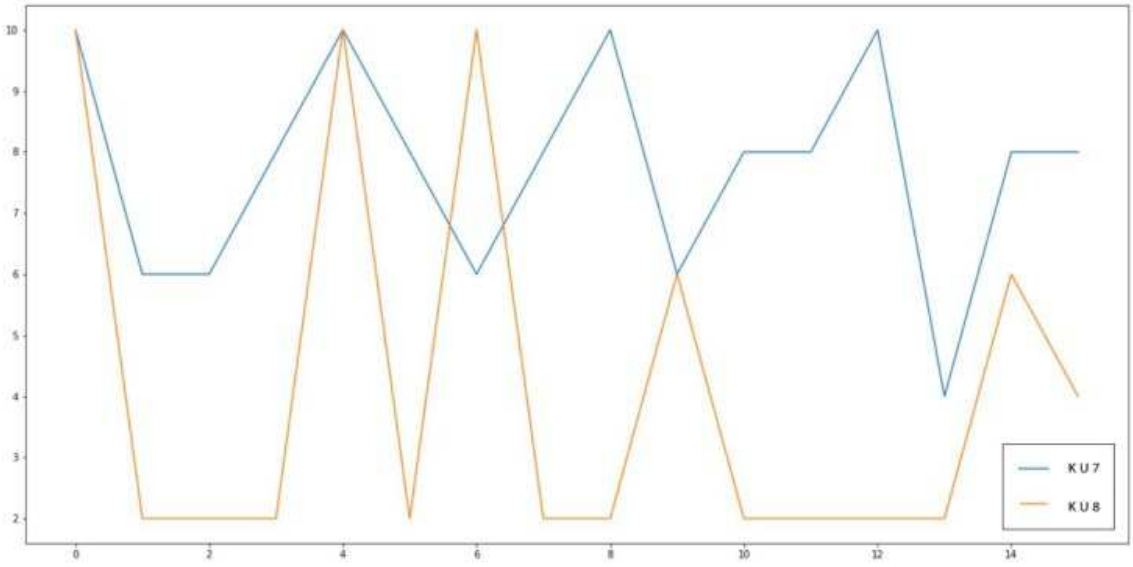

Figure 17. *Line Plots for Assessment of KU node.*

DP2: VP > Learning orientation (Instructional scaffolding) > Grade 8 students (except one student) did very well as compared to the Grade 7 students because they made detailed drawings of the final product they had decided to make. Some ideas brought out a fair amount of imagination and newness (Figure 18).

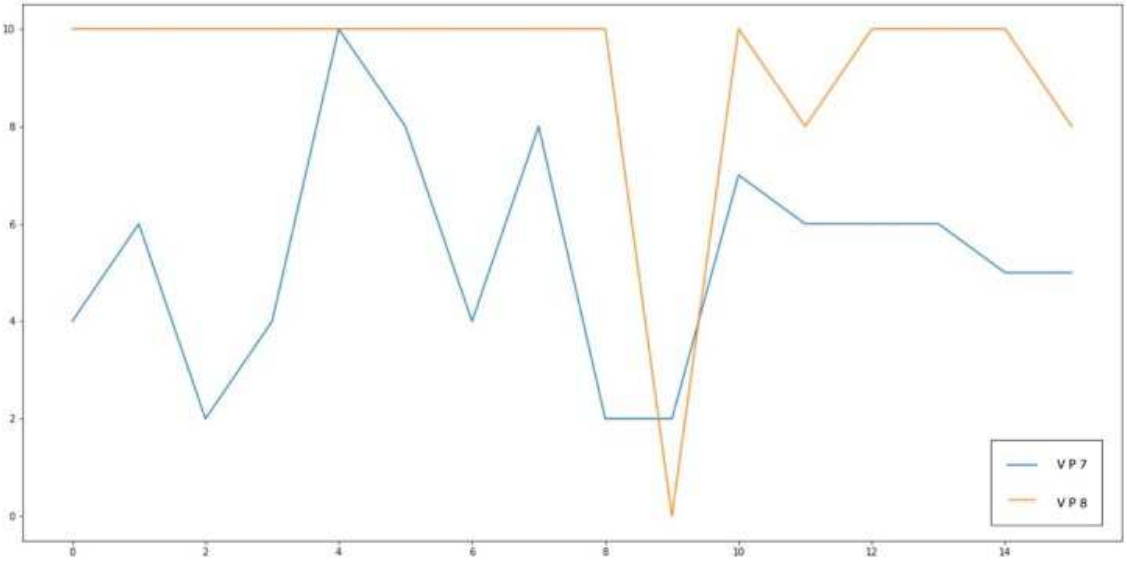

Figure 18. *Line Plots for Assessment of VP node.*

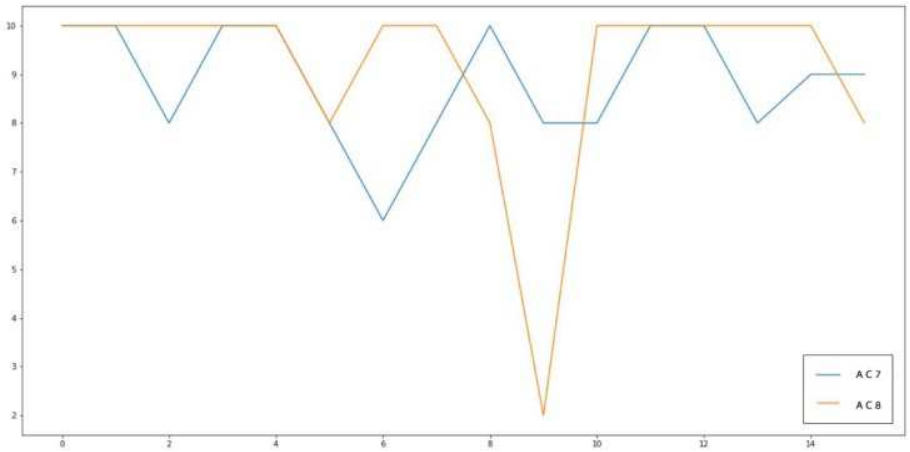

Figure 19. *Line Plots for Assessment of AC node.*

DP3: AC > The Design Process > Both the Grades, 7 and 8 followed the design process and made the final product. Grade 8 was more consistent except one student who did not attend classes but attempted to do the assignment so that she does not lose out on the marks (Figure 19).

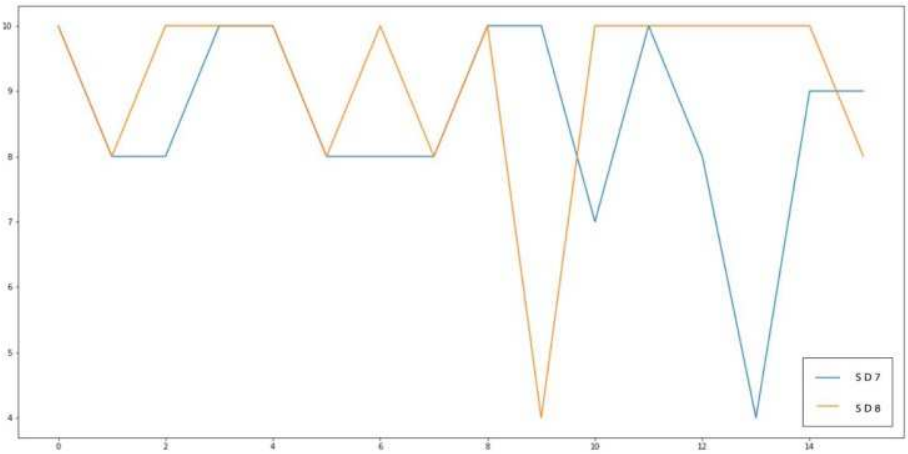

Figure 20. *Line Plots for Assessment of SD node.*

DP4: SD > Material and social resources > Both the Grades, 7 and 8 used the skills they had acquired through exploration and practice. Both had one student each, who did not attend classes but attempted to do the assignment so that they do not lose out on the marks (Figure 20). The teacher gave marks as per the individual benchmark for each student and how effectively they were able to externalize their visualization. The students' skills were not compared to each other.

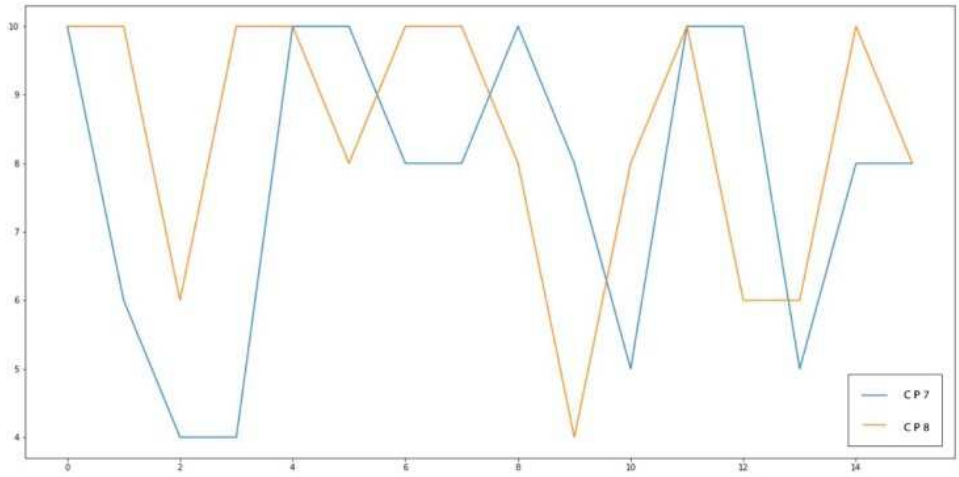

Figure 21. *Line Plots for Assessment of CP node.*

DP5: CP > Grade 8 succeeded in presenting their design process better than Grade 7 marginally (Figure 21). Grade 8 students documented the design process slightly more efficiently.

The authors have studied the findings from the end task to assess the students' learning. In Grade 8, 16 students submitted their work out of 22 students, whereas in Grade 7, 16 students submitted out of 23 who attended classes. 9 students of Grade 8 and 4 students of Grade 7 did not make the price tag nor gave a brand name. Out of 22, 4 students of Grade 8, and out of 23, 3 students of Grade 7 still understood Design as decorative art.

INTER HOUSE DESIGN COMPETITION
LOWER SCHOOL

BRIEF: DESIGN FOR RECYCLE AND REUSE
Make a recycled product out of unused or waste material you have at home.
Use mostly natural material in your immediate surroundings and which is easily available at home for visual appeal and decoration.
Make an detailed design PPT with the following:
MAKING THE PRODUCT

1. Think/ Ideate:
    a. Materials
    b. 3 concept drawings
    c. 100 words explaining the purpose of your product.
2. Plan: What tools and hand crafting technique will you use?
3. Create: Describe in steps along with photographs/video, the process of making your product. (Photos will be evidence of different stages of you doing the work).

BRANDING: Make a brand + price tag.

1. Think/ Ideate:
    a. 3 concept sketches.
    b. Reflect and improve on one concept:
    c. Explain in no more than 100 words about your brand name and design.
2. Plan: What medium and material will you use?
3. Create: Make your tag. Submit your costing sheet costing sheet for the pricing of your product in INR.

PRESENTATION: PPT presentation or a video.

RULES:

- Entrants must be from Lower School. Individual or Group of two people.
- Maximum 6 entries from each brother-sister house, best 4 entries will be counted for marks in each category.
- The craftwork must be submitted before the deadline.
- Each student can enter up to two submissions
- Images should be no larger than 2Mb and in PPT or PPTX format (maximum 20 slides).
- Your file name must follow this format: STUDENT NAME.HOUSE.CLASS

TIMELINE:

- Briefing with house participants: 18th May 2020, Monday, 2:30 pm
- Submission : 10th June 2020, Wednesday, 5 pm in zoom class for IH ART & CDT

JUDGING CRITERIA: 100 marks. There will be a panel of 5 judges.

1. Concept: 20 marks
2. Visualization: 20 marks
3. Creativity : 20 marks
4. Skill: 20 marks
5. Presentation: 20 marks

PRIZES : There will be an IH DESIGN JUNIOR CUP for Winner's trophy and overall house positions.
The IH DESIGN CUP will be given to the winner of the collective position of SENIOR & JUNIOR category. These will be running trophies.
NOTE: The original product must be submitted when you come back to school for marks verification.

Figure 22. *Guidelines for Intra-school competition.*

The Intra-school Competition: After attending 4 classes of 40 minutes each, a sample of the 19 students from Grade 7 and Grade 8 (a random mix of the students who attended and who did not attend the classes) participated in an

intra-school competition. Any queries related to the guidelines that were posted (Figure 22) to the students by the teacher, were answered at the beginning of the competition during an orientation meeting. The time boxes and the Costing sheet given in the classroom earlier, were not given to the students participating in the competition. The peers and mentors who had gone through the Design assignment in class earlier, were allowed to mentor the participating students. The teacher did not offer any assistance or scaffolding this time.

The peers and seniors who had gone through the Design process in class earlier, were allowed to mentor the participating students. The images presented by the students which were used for participatory visual research are shown in Figures 23, 24, 25 and 26. Out of 19 students, only 5 made concept sketches and presented the design process in detail though a PowerPoint presentation or video (Figure 23, 25), 4 of them did costing and branding but did not show conceptualization (Figure 26), and 10 of them gave emphasis to decoration (Figure 24) rather than the process.

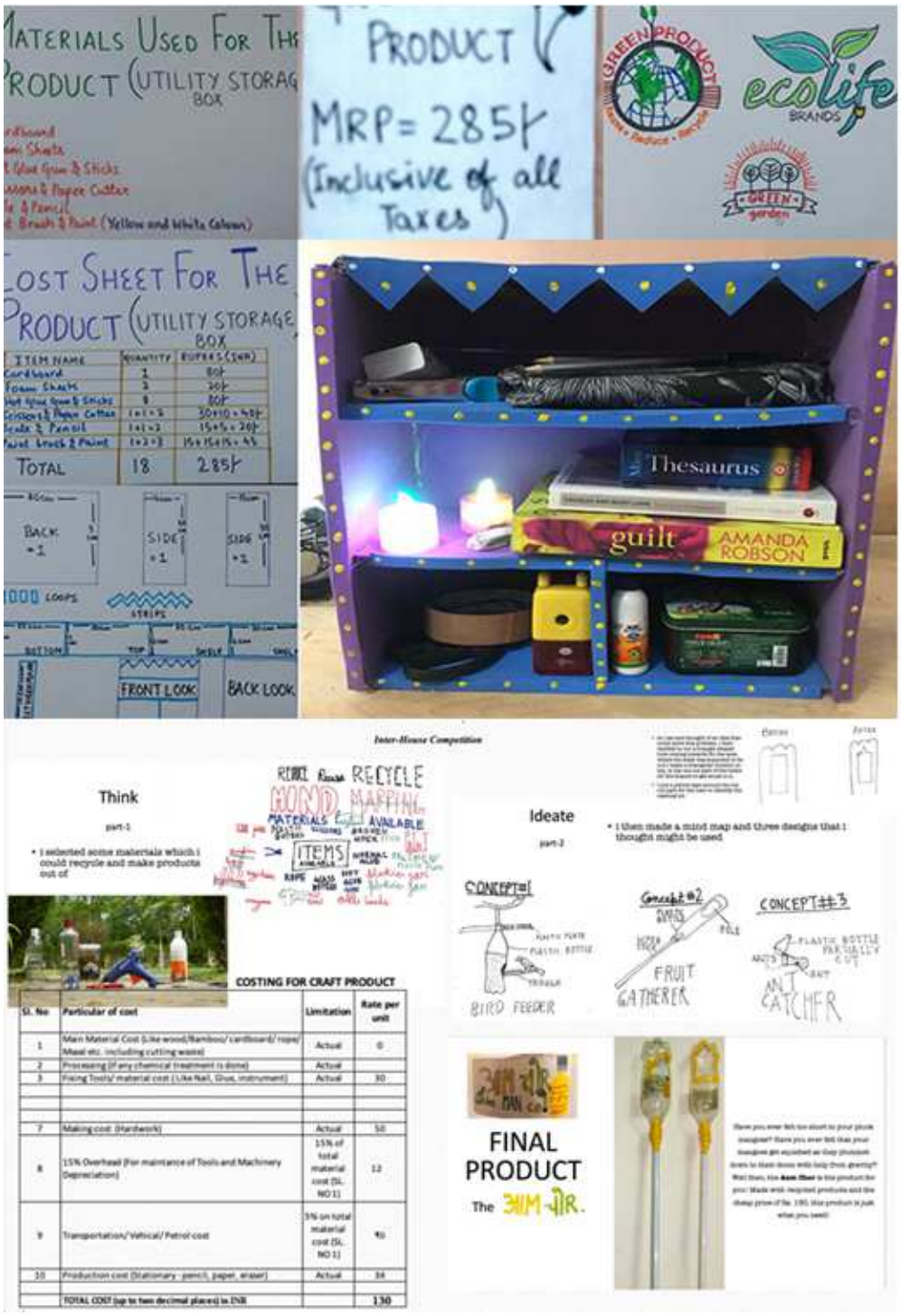

Figure 23. *Images of Competition Submissions.*

Figure 24. *Images of Competition Submissions.*

Figure 25. *Images of Competition Submissions.*

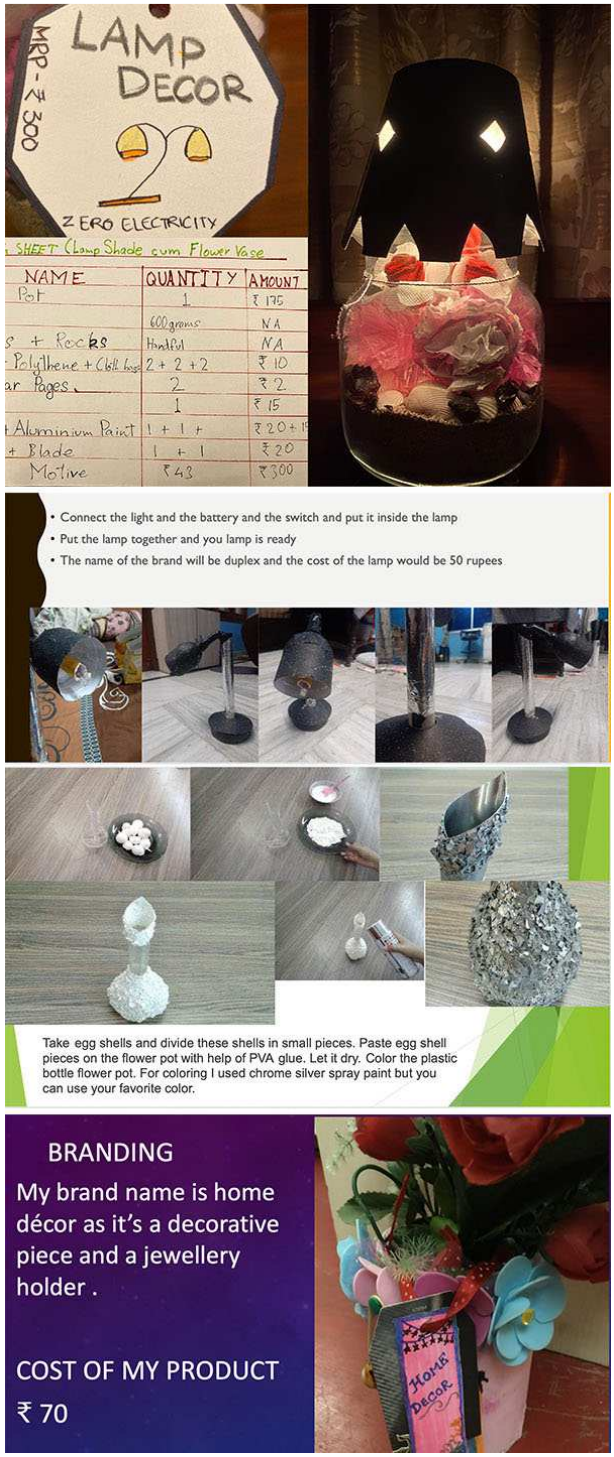

Figure 26. *Images of Competition Submissions.*

4.2.4. Findings

The work presented in the competition indicates that 5 out of 19 students were able to follow the design process without teacher guidance after they had done one assignment in class. The authors believe that with more classes, the designerly approach can be instilled in the students to build the capacity to cope up with the challenges that they would face in their lives. The Grade 7 students have displayed an exploratory and experimental approach which is an important step in the

creative process. With more skill inputs, the authors believe that they would be able to plan and externalize their ideas in detail. From the response of the Grade 8 students, the authors have deduced that if the assignment is posted in parts where the students must do each part thoroughly, they will not get a chance to skip the conceptualization steps. It is important to instill design thinking in Grade 7 so that when the students reach Grade 8, they are more open to experimentation of possibilities and their creative instincts are developed further. Though a common assignment the authors could identify the difference in the design approach of the students of Grades 7 and 8.

5. Conclusion

To summarize the content of this paper, the emerging themes have been categorized after a systematic literature review of the education theories. This has assisted in the development of a conceptual framework of the design and structure of learning activities for design education at school level. The authors have been able to explicitly map design knowledge, skills and praxeology based on Bloom's taxonomy. Bruner's 'spiral curriculum' has set a philosophical foundation for extensive training for development of the 'iconic modes' through material and handcraft culture. Maslow's motivation theory proposing reward and competition set in a contextual environment, provides guidelines for setting the subject of 'design' in the curriculum, in the Indian context. Vygotsky's method of scaffolding and the ZPD have been a crucial factor in the selection of grades 7 and 8 as the sample for this research study. Vygotsky's emphasis on material and conceptual tools coupled with Gal'perin's conceptual model on the process of the learning activity form the basis of the pedagogy and the assessment structure designed by the authors. Kolb's ELT and LSI provide a strong theoretical foundation to build on the conceptual model which is applied in the practice of teaching design to Grades 7 and 8 in the CISCE curriculum in India.

The authors have analyzed the data through the recorded zoom classes and have reflected on each class for improvement. They have logged the required changes for enhanced learning during their classroom teaching in the future. The authors recommend that for the constructive development of the learner, a provision for extensive feedback though peer assessment during classes or other alternate means needs to be made; the authors could not focus on extensive individual feedback because of lack of time during the academic transaction.

The authors have documented the students' response and participation in the specifically designed learning activities with material and social resources, through direct observations, participant observations and participatory visual research. This research study has presented data inclusive of the implications of translation of the theoretical model into practice. Since the author has studied a single case, it is recommended that the study should be supported by additional studies in future. The systematic and elaborate models presented in the paper can be adapted and examined in further research and practice, both in physical and offline classes. The findings and the field work presented in this paper must be understood as theoretical and practical guidance that can be adopted and operationalised in educational practice.

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