Student Satisfaction Index in Synchronous e-Learning a Case Study

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Abstract

Design-Based Learning (DBL) is an educational teaching pedagogy that combines inquiry-based learning with design thinking. It aims to engage students in real-time situations and hands-on learning experiences where they apply design principles to observe the activities and identify the tasks which can be done or solved by an alternate way. DBL encourages creativity, critical thinking, collaboration, and problem-solving skills. DBL experience fosters student engagement, motivation, and a sense of accomplishment, leading to greater satisfaction with the learning process. Positive emotions, such as excitement, curiosity, and enjoyment, are often associated with higher levels of satisfaction. When students feel motivated, interested, and connected to the course, they are more likely to be satisfied and enjoy their learning experience. Effective teaching practices, supportive e-learning environments, and addressing individual student queries can all contribute to enhancing student satisfaction and overall learning outcomes. In synchronous e-learning, design thinking approach is applied during the instructional design process. In this paper the systematic review and survey aimed to explore the relationship between emotions during design thinking course in synchronous e-learning and Student Satisfaction Index (SSI). The research methodology involved a mixed-methods approach, combining quantitative data through surveys and qualitative data through interviews. The activities were designed to enhance attentiveness in class, student autonomy, active involvement in every task, opportunities for collaboration, and a sense of ownership over the learning process and maximize the learning in synchronous e-learning mode. The case study findings are investigation of activities done in the "Design Thinking" course at the First year Engineering. The learner's response to the online survey as individual and as offer valuable insights that activities conducted proved to be an effective pedagogical strategy in e-learning mode to enhance student satisfaction and overall educational experiences. The findings emphasize the importance of adopting innovative pedagogical methods that empower students and foster a positive and joyful learning experience. The student satisfaction index (SSI) a dependent variable of e-learners emotions was analyzed by correlating the survey responses obtained from questionnaire about the course objective, course outcome, contents, delivery method, knowledge gained, skills acquired during the course in e-learning mode.

Keywords

synchronous e-learning, e-learner, emotion, design thinking, student satisfaction index

1. Introduction

Design thinking revolves around human beings. The pillars for design thinking are human centric design and planet centric design which is empathy with users with sustainability at its core. Design thinking is a process of making observations of domain under consideration and noting down all the activities happening around it. Design thinking is a problem-solving approach that emphasizes understanding and addressing the needs of users or customers. It is a human and planet centric approach, an iterative process that involves empathizing, defining the problem, generating ideas, prototyping solutions, and testing them [1]. Design thinking encourages creative and collaborative thinking to come up with innovative and user-centric solutions [2]. Design thinking encourages collaboration and co-creation, allowing learners to contribute their insights and ideas to enhance the learning experience.

E-learning has gained significant popularity in pandemic. With the recent advancement of technology and the increasing need for lifelong learning there is rise in e-learning platforms. E-learning is a powerful tool for learning including schools, universities, corporate training programs, professional development, and even informal learning initiatives. Types of online learning can be synchronous, asynchronous, blended and MOOCs. Synchronous e-learning, refers to a type of online learning where participants engage in learning activities simultaneously in real-time. It involves interactive sessions where learners and instructors can interact with each other, ask questions, and receive immediate feedback. Synchronous e-learning typically uses communication tools such as video conferencing, chat, and live streaming to facilitate real-time collaboration and engagement. It involves actively involving learners in the design process, gathering their feedback, and iterating on the learning materials and activities to improve their effectiveness.

There is an overall paradigm shift how Gen Z learners perceive learning and make career choice. The popularity of course specialization available on various e-learning platform as per the market demand are attracting the attentions of e-learners. Agility, thirst for knowledge, curiosity to know more, technological advancement is some of the key characteristics of Gen Z learners. Thus, the design thinking approach needs to be taken to online classrooms to make them aware and help them to practice empathising with people, planet and society [3]. Overall, combining design thinking principles with synchronous e-learning can result in learner-centric and engaging online learning experiences. It allows for a collaborative and iterative approach to designing and delivering content, leading to better outcomes and increased learner satisfaction. Furthermore, design thinking can help in designing engaging and interactive activities in synchronous e-learning sessions. By employing techniques such as brainstorming, rapid prototyping, and testing, instructors can create dynamic and interactive learning experiences that promote active participation and knowledge retention. Through this course the students were encouraged to reach out to the society, create a sense of giving back to society and practice empathy through self-awareness. The curiosity about the identified domain is the first step in design thinking process. Empathizing helps in multidimensional scope of thinking through the lens of social, emotional and cognitive [4,5]. Designing activities need integration of user centric, planet centric and domain centric approach to convey the significance of each one of them.

The e-learning process must be an engaging process where contents delivered and perceived serve as tool to support knowledge building and skill development in students' satisfaction index. Activities designed and executed map to the cognitive, emotion and skills of e-learners.

Student Satisfaction Index (SSI) can be defined as index that reflects a holistic e-learners emotions measured by capturing the attributes contributing to students' engagement during the course. SSI is directly proportional to the e-learners' emotions. Some of the he attributes which contribute to e-learners' emotions during the course are knowledge & skills gained, teaching pedagogy, course content delivery sequencing, e-learning platform, learners' engagement and involvement during course and assessment techniques utilized can be accounted as shown in figure 1.

Therefore, typically SSI can be calculated as:

$$SSI = \frac{\text{Sum of each identified attribute}}{\text{Total number of attributes}}$$
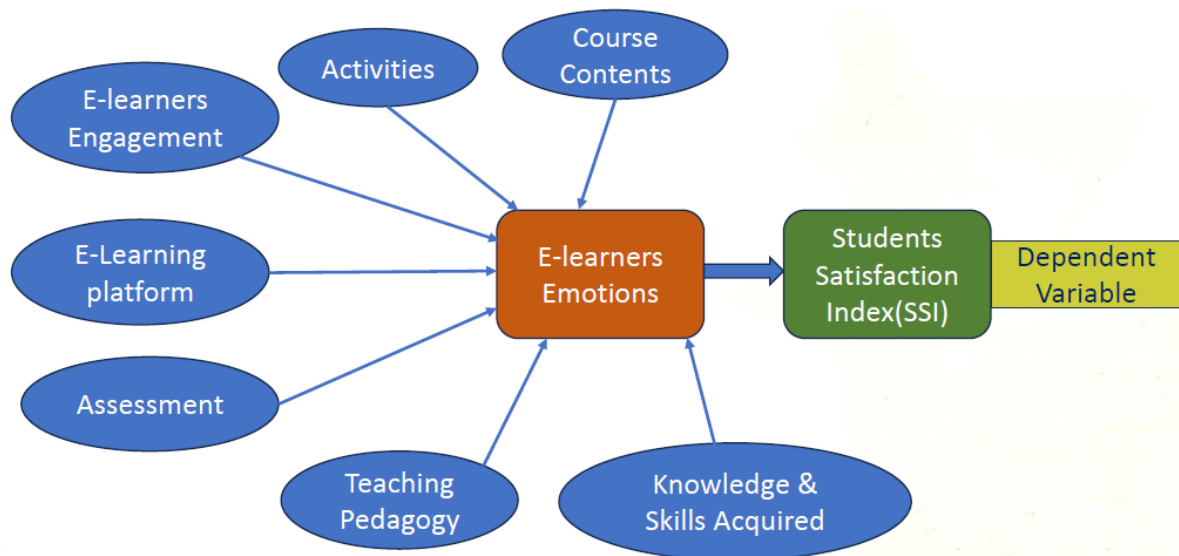
Figure 1: Attributes Influencing Student Satisfaction Index

The methodological design shows the type of data collected through survey, and activities that are more suitable for analyzing the outcome in order to detect and interpret the e-learners' emotions. Engaging activities and joyful learning generate positive emotions and the SSI is higher. The context of the paper is to evaluate the approach to learning as design-based course in online mode and to examine the role of emotions during online learning in design-based learning subject and corelate it with the SSI. This study investigated the review the effectivity of bridging the gap from project-based learning to Design based learning in virtual mode.

2. Design Thinking Course Execution

Design Thinking as a course is executed into three stages to take them through experiential learning. The first stage of the process aims to capture the context of the observation of identified activity to which solution can be offered. During this the learner emphasizes understanding the problem in a given context. The student learns to understand the different challenges and possibilities involved in the offered alternate solution [6,7].
The second stage is the Market research or available literature. It helps learners understand which information is to be collected to generate design ideas.
The third stage allows the learners to try to implement the solution. The solution can be presented through dirty mockups, 3D printing, Metal or wood prototype models. This is followed by testing and validating the iteration of the solution via going back to the user who was at the center of the design solution.

The Course Objectives:

- To disseminate the philosophy of design thinking with e-learners. Enhance thinking to inspect diverse solutions.

- Sensitize about the feasibility, desirability and viability criteria for selection of appropriate solutions.

Research Group – Students of First year engineering, Weekly contact hours of 4

During the pandemic there was a immediate need to go online and continue imparting education and innovatively define the above stages to be completed online. The teaching fraternity started preparing

for how the course would be made interesting and the course objective can be achieved even during the online mode delivery. Adaptability to current situation shaped the teaching pedagogy. With the current development immediate adaptability was required in delivering the course. DBL was implemented and experimented. The teaching strategies introduced in the course were designed to evaluate engineering students' cognitive and affective skills. The course was conducted on MS Teams platform. MS Teams as learning platform really helped to foster collaboartion through breakout rooms. Some activities were designed to explore the individual exploration and logic reasoning skills and remaining most of the activities were introduced to sharpen their skills in cognitive and social domain. The process flow diagram shown in figure 2, broadly gives the tasks under which different activities were planned during the course conduction. During this course the students learned to practice empathy in their day today activies. This in turn enhanced their thinking process. They were challenged during every class by introducing activities and sharing the reflection after the activity. The take home from every activity was intresting and enriching. The course teaching focused on creative and transformation use of technology during the class. An activity like sharing best liked invention and innovation was conducted on padlet platform as students were able to view each other's liked product innovation. The students presented the time for the chosen most invention and innovation by using online available software for timeline designing tools.

To navigate the e-learners in the design-based learning curve following activities were conducted during the class.

1. Mind map of domain
   The objective of conducting mind map activity was that the students should identify domain around them and map all the activities happening in the domain. In the process of identifying domain the instructions were clear that it should be centered around human. The technique of mind mapping is taught which helps the student to look at the product/process from all possible aspect and the entity which affects the performance.

2. Activities and observations in identified domain
   Listing of activities, noting the observations, acquisition from mind mapping and random checklist technique will enable the student to understand the product or process comprehensively. The activity helped them empathize, organize, analyze and represent all observations graphically. This graphical representation presented in class helped expand the map in spatial and dynamically adding observations as received from other class members. This activity was impactful during the ideation step. Expanding and analyzing the mind-map connect observations to generate ideas. This brings forth the thoughts during observations in form of tree and adding nodes which can keep branching.

3. Identify pain points from above exercise
   The information gathering from various sources and its analysis stimulates the student's creativity through insights to offer innovative solutions for the defined problem. The student learns to develop empathy towards users.

4. Brainstorming in breakout rooms
   The larger groups were split by msTeams into smaller groups and the learners were grouped randomly every activity, giving learners a chance to know their peers through ice breaking session and allowing them to collaborate, build rapport with one another, and hear from them as it was the need of hour. It really helped in active engagement and whole hearted participation in the activity. This also served as a very good team building activity. The brainstorming session on the domain mind-map helped students to identify pain points. This was the first process in which the students were put in the MsTeams breakout room. This helped them explore creativity to offer solutions on identified problem. The students further discussed the solution from three spheres of viability, feasibility and desirability. The intention was to introduce the innovation concept by showing the relevance of solution from each attribute and intersection of these spheres.

5. Story telling

   Story telling was very effective mode of communicating the pain points and needs of the user. The story was weaved incorporating all the activities of the user and described with user as center character. The user- centric approach to clearly get the user think and feel, how user hears, says and does. The story telling happens around this user character and helps in clear visualization and narration of user activities where, why, how, what and for who all consider situation, context, location.

6. Journey mapping

   A journey map is a visual story, an invaluable and essential of user engagement around the identified problem. The journey mapping helped to understand processes, needs, and perceptions of user under consideration.

7. Sketching

   It was an exciting way to put the learners' minds and thoughts on how they expect the solution offered to work.

8. Mapping User Centric Design and Planet Centric Design in line with Sustainable development Goals (SDG)

   The students were introduced to the sustainable development goals (SDG) 2030 given by UN from the viewpoint of mapping the identified solution to one or more pillars of SDG. This further took forward the thinking process to redefine or reframe the problem statement to align it with sustainability. The case studies from global initiatives for SDG and the case studies from "The Better India" gave an insight into solution implemented and their reach for better society. It also created an awareness about planet centric domain driven initiatives. This activity was designed to refine the solution to consider the sustainable development goals and understand how every solution offered should take into account the right use of available resources on planet so that they don't deplete and are sustainable to create a better place for the next generation.

9. Evaluating the proposed solution

   Feasibility, viability and desirability study are presented by learners for the solution offered and whether the user has validated the prototype solution to take it forward for product development.

10. Final Digital Portfolio

    The reflection report of all the activities conducted, the journey of it and submission of assignment done on learning management system are consolidated and a final digital portfolio in form of website or power point presentation were presented to the jury and peers. Evaluation by peers and team members of contribution and role in team helped to great extent assess the final digital portfolio. The e-learners were assessed on rubrics for critical thinking, planning as a team, communication, execution.
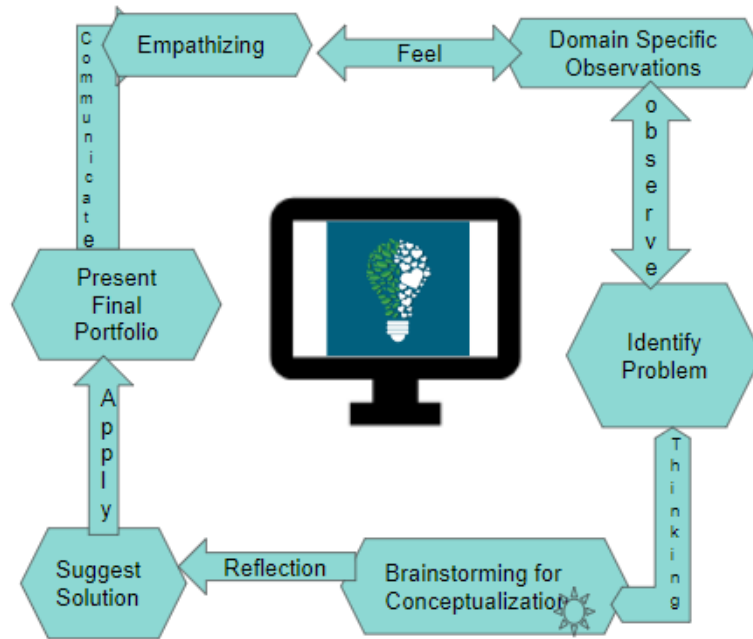
Figure 2: Process Flow Diagram

In online course it was more about pilot study of an idea than prototyping as resources for implementation were not available during learn from home. The action research was done by a group of students. The design thinking framework shown in figure 2, was followed AEIOU -Activities, Environment, Interaction, Object, User framework and taking it further to empathy mapping canvas, ideation canvas and Prototyping canvas[8,9].
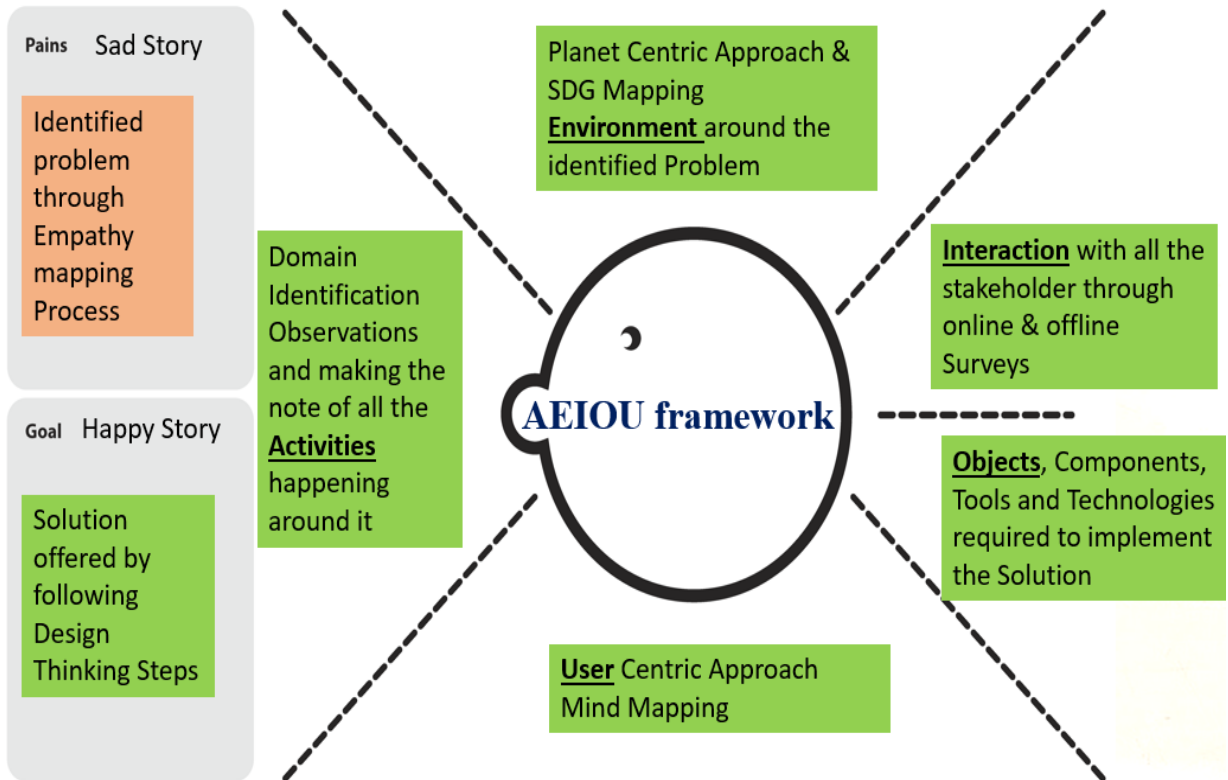
Figure 2: AEIOU framework

Figure 3 shows the word cloud conducted in online class which gives a reflection of the keywords about design thinking as per the learners and at the center of this word cloud is Empathy.
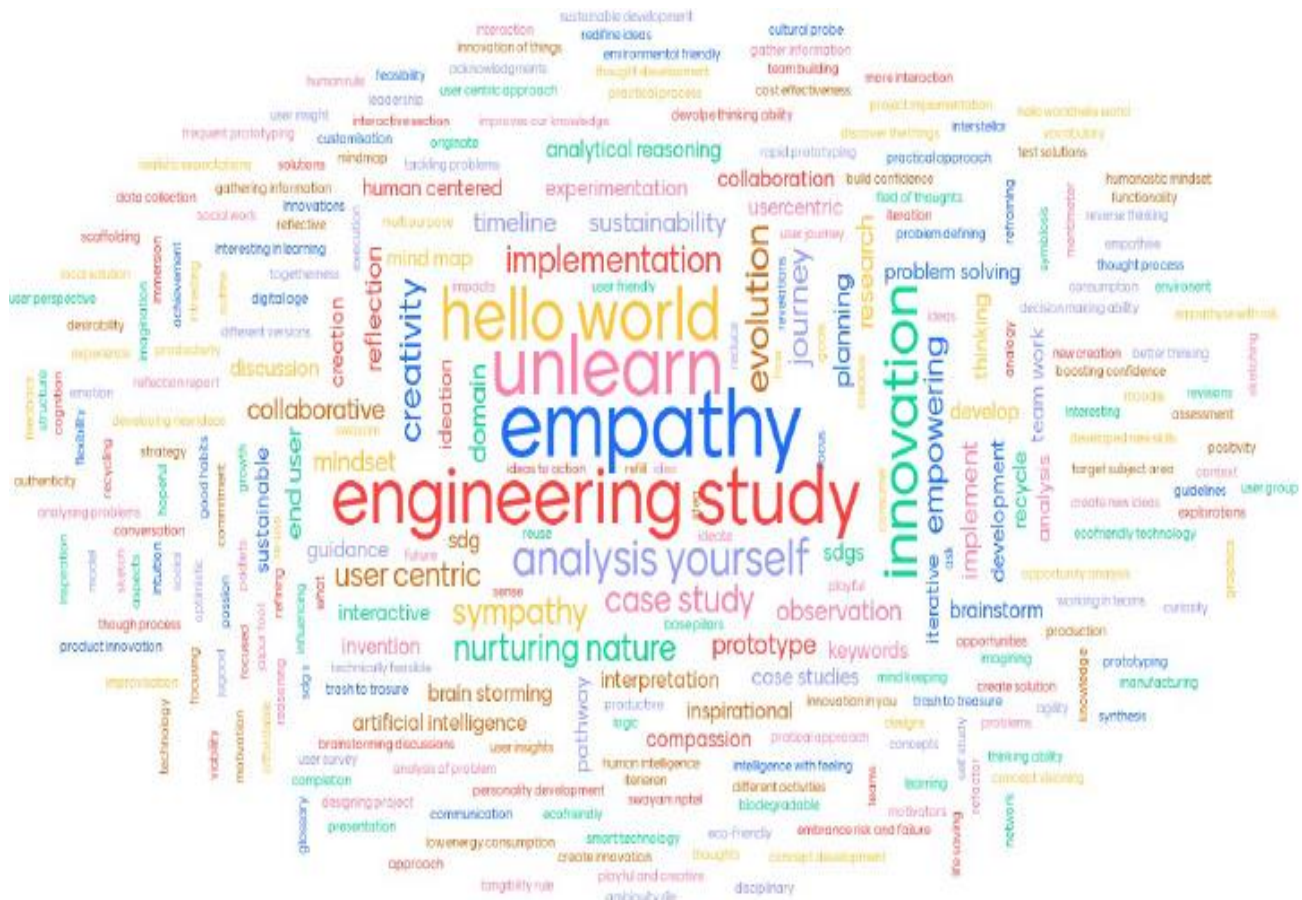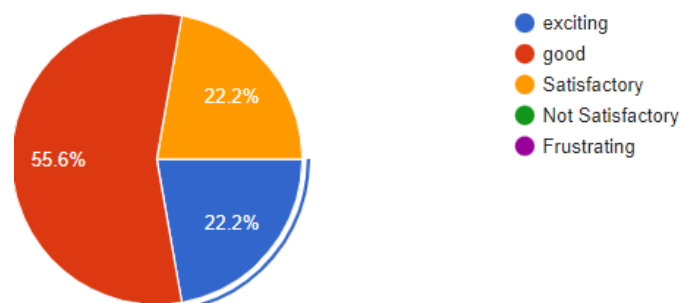

Figure 3: Word Cloud Activity -Thoughts about Design Thinking

3. Discussion

Following are the responses of the e-learners in the "Design Thinking (DT)" Course

1. Online Teaching Learning process in DT course was

This attribute to assess the emotions of learners considering exciting and good results to 77.8%.

It is observed from the result that there are no students who are not satisfied or frustrated. The satisfaction of the learner is 100% with this course.

2. Were you challenged during online class activities?
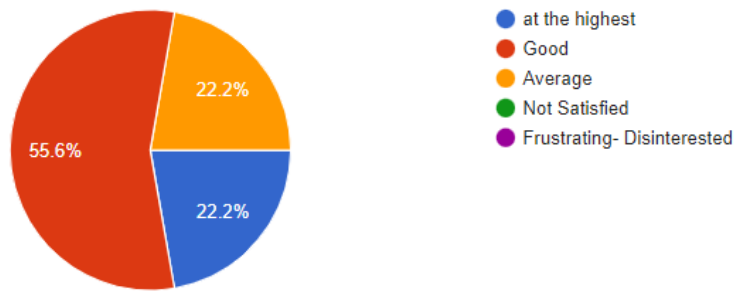
The attribute of teaching pedagogy assesed through this question gave the results of 77.8% where in the contribution of the learners response of being challenged at the highest and good was accounted. The empathy mapping and story telling excerise helped the e-learners to challenge themselves with their belief system.

3. Attention Span/ Concentration during Course
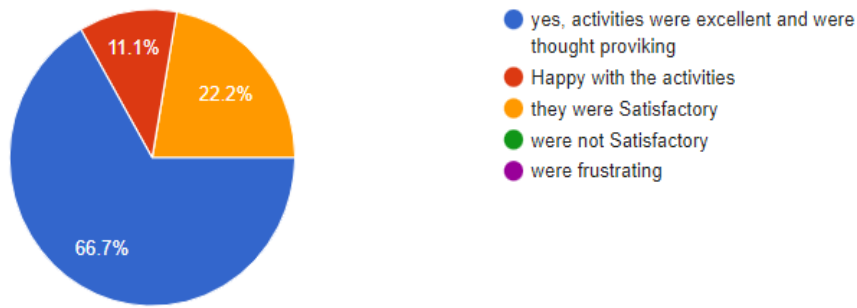
The involvement and engagement during the course was excellent with 77.8% of e-learners actively participated and completed activities submission intime. Some activities like celebrating earth day and mapping with SDG, trash to treasure, scamper for ideation, sketching and journey mapping kept them engaged in discussions.
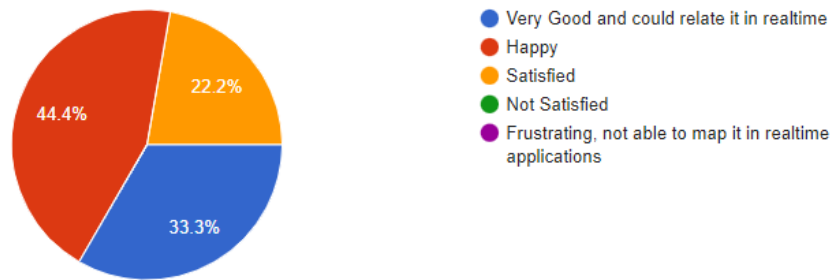
4. Knowledge Gained during online learning
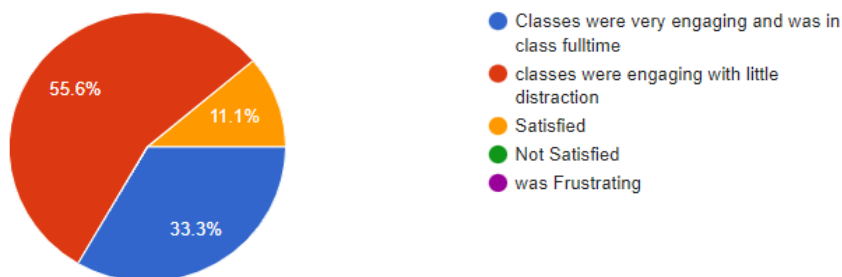
88.9% e-learners agreed that classes were engagining as they were busy collaborating in breakout rooms to complete the assigned task. User enteric design and planet centric design

5. Motivation Level during online class was

The SSI calculated from the above attributes contributing to e-learners emotion showed that 80.2% e-learners were satisfied and figure 4 reflects that emotions during the course were more of excitement. Thus, positive emotion during the course yields a higher student satisfaction index.

The course exit survey conducted yielded the following results where it reflects that the e-learners agreed that the learning objectives and outcomes were and the

[1]. The goals/Objective/Outcome of the course were clear to you
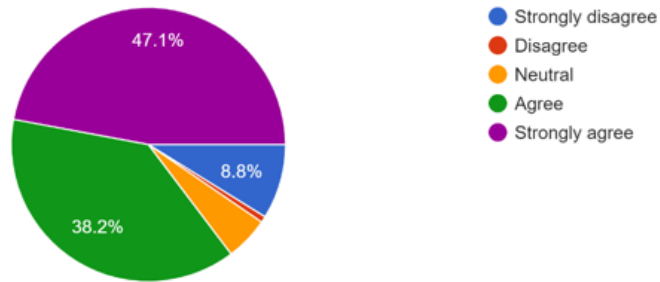136 responses
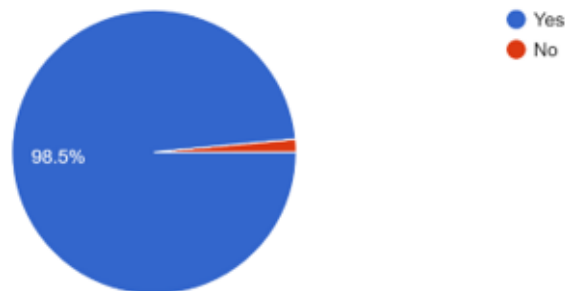
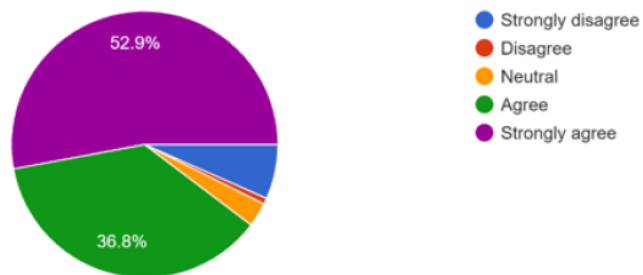[2]. How do you rate content of the course?
136 responses
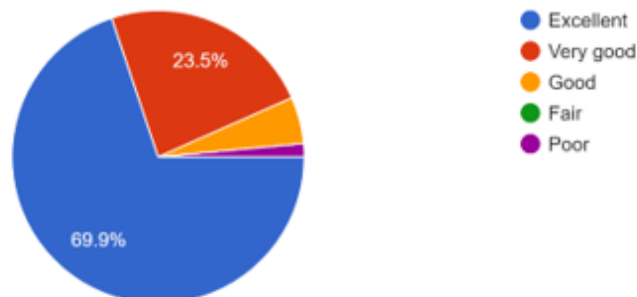
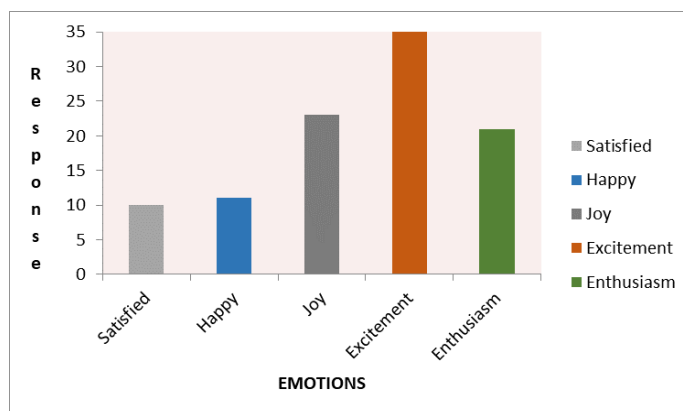[3]. The course contents met with your expectations.

136 responses

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

47.1%
8.8%
38.2%

[4]. The content sequence was well planned

136 responses

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

52.9%
36.8%

[5]. The course exposed you to new knowledge, skills and practices.

136 responses

- strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

65.4%
25%
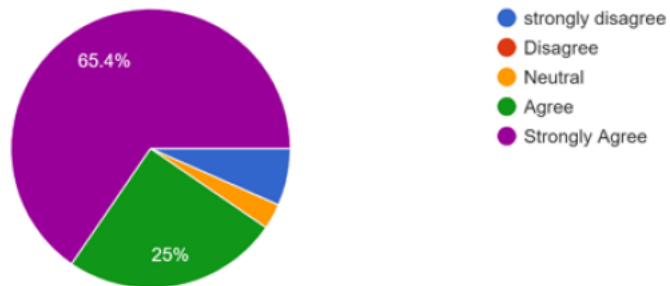
Figure 4: Results of Emotions of e-learners

From the five course exit survey questions e-learners response to outcomes and objective achieved reflect that 98.5% of learners agree, 93.5% learners received the right course contents and most of them

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strongly agree that the course exposed them to new knowledge, skills and practices. Figure 4 shows the emotions of e-learners' emotions and the highest emotion expressed by the learners is that of excitement. This reflects that most of the leaners enjoyed this experiential learning course in online mode.

1	Timestamp	Express your emotions through words about the course
2	4-16-2021 15:01:20	very interesting course, always learn something new from it.
3	4-16-2021 15:05:40	Very Interesting, innovative, enthusiastic course.
4	4-16-2021 15:09:34	It is very interesting and innovative subject. We get to learn many different things with the help of these subject
5	4-16-2021 15:23:13	It's very interesting subject. In each and every class something new we get to learn and lecture s are really enjoyable.
6	4-16-2021 15:25:36	To be honest it's really fun to like, listen new stories everyday and also learn very beneficial things from those stories. Overall the subject teaches us to identify the problem,
7	4-16-2021 15:29:00	Self transforming, self expressive and Thought developing wonderful course
8	4-16-2021 15:34:34	i am happy with this subject.... it help to explore a Skills...
9	4-16-2021 15:43:12	Design thinking allow us to know about the power of thinking and observation as everything that see in our world are come out through innovation only and for innovation we have oberve the problem in our surroundings , need to think for solution in same way
10	4-16-2021 15:52:24	The course taught me to empathise towards people and find a solution for thier issues
11	4-16-2021 15:53:31	As soul important part body, design thinking is important part of learning
12	4-16-2021 15:54:02	Makes me feel fresh, concentrative, positive thinker, good researcher, and many more.
13	4-16-2021 15:57:01	Also it makes me excited and happy
14	4-16-2021 15:57:05	The outlook on the surrounding changed also developed our thinking and also many more new things learned can't count in the words
15	4-16-2021 15:57:22	It creates the future innovaters, designer as it teaches us that how we can find the solution of our problems by innovatively , it's develop a mindset among the students that really proves helpful to think creatively.
16	4-16-2021 15:57:42	Design Thinking is interesting subject and I learned many things from that subject
17	4-16-2021 15:57:54	Learning dt is very useful and helpful for me, because of it I have came across the things which I've never heard of
18	4-16-2021 15:59:10	we studied in first semester. This subject simply give shape to our minds and creativity. I think this subject is different from other subject because there is no limit for syllabus ,so
19	4-16-2021 15:59:18	It is very developing , innovating, and inspiring

Figure 5: Snapshot of Textual reviews of e-learners

Figure 5 the textual reviews from e-learners show that emotions play a very significant role in understanding and participating in the course [10]. The reviews submitted expressing their emotions about the course reflect that the learners really enjoyed the course.

4. Conclusion

The quantitative and qualitative results clearly depict interesting and engaged learning generate positive emotions. The study advocates for the inclusion of analyzing the emotions of e-learners during the course through textual interactions to reduce the dropout rate from the online course. Exploring deeper into the intricate relationship between emotions and the learning process unveils a realization that this connection holds more significance than can help achieve joyful experience of education and very good SSI. Thus, it reflects, emotions are a part of cognitive learning and satisfying journey. As this exploration of emotions during learning advances, the growing clarity is that the level of involvement and engagement stretches far beyond a minor role of concentration during learning. This

study is limited to a semester long course. As a result, for the study's findings to be generalized, it must be taken to large number of students, varied courses and in a variety of educational contexts.

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