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TOWARD A FRAMEWORK FOR SUSTAINABLE EXPERIENCE DESIGN EDUCATION AND AN ILLUSTRATIVE CASE OF A SERVICE DESIGN THINKING COURSE

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ABSTRACT

In sustainable experience design education, experience activities of consumers and users, design activities of student designers, and education activities of instructors should be addressed. It would be meaningful to compare various sustainable experience design education efforts considering regional and cultural context. This paper describes a framework where experience, design and education activities are systematically represented with diverse contexts also represented in a structured manner. Student design projects in a service design thinking course are illustrated where sustainability is gently introduced.

Keywords: Sustainability, Design education, Design process, Experience design

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1 INTRODUCTION

In sustainable experience design education, experience activities of consumers and users, design activities of student designers, and education activities of instructors should be addressed. It would be meaningful to compare various sustainable experience design education considering regional and cultural context. This paper describes a framework where experience, design and education activities are systematically represented with diverse contexts also represented in a structured manner. Student design projects in a service design thinking course, where sustainability is gently introduced, are illustrated as a way to utilize the framework.

The issue of sustainability has been actively integrated into design and design education. Some efforts address sustainability as a part in design education, while others use design as a way for sustainability education (Boks and Diehl, 2006). The evolution of design for sustainability methods shows gradual transitions from a product innovation level to a product-service system (PSS) innovation level, and to a socio-technical system innovation level (Ceschin and Gaziulusoy, 2016). A higher emphasis has been placed on consumer activities and behavior first, then this has evolved to encompass new services, educating and facilitating desirable consumption behaviors (Bhamra et al., 2011). As an approach of design for sustainability, PSS design has received a lot of attentions as many PSS research has focused on sustainability issue (Goedkoop et al., 1999; Tukker, 2015).

With the goal to build the network of higher education institutes in Finland and in various countries in Asia in order to share successful efforts in Sustainable Experience Design Education in Finland and in Asia and to communicate learnings about not-so-successful trials in such educational endeavors, the "*Finland-Asia Network for Sustainable Experience Design Education*" (SEDE-FAN) project has been launched in 2022. In this way, the knowledge and principles underpinning such educational methods and expertises can be collected, stored, exchanged, retrieved, reused and enhanced through the network. Participating higher institutions offer diverse courses at undergraduate and graduate levels where the sustainable consumption and experience issues are educated in the form of design projects. Such design project based learning efforts typically employ problem-based learning approaches through team-based projects. While the specific courses may have diverse detailed contexts of education, these courses share the underlying method of design thinking in that human-centered problem solving method and mindset are transferred to students in possibility-focused and hypothesis-driven manner (Kim and Park, 2021).

In this paper, the framework is explained addressing how those activities in sustainable experience design education are represented with specific and rich description of contexts followed by descriptions on how design activities are represented and studied in related fields. Then a specific design project of a service design thinking course, that addresses design thinking in the context of service-dominant logic (Vargo and Lusch, 2004) and experience economy (Pine and Gilmore, 1998), is then described in detail including education activities, design activities and consumer experience activities. Some reflections on the design project case is then presented before the paper is concluded with summary and discussions.

2 FRAMEWORK FOR SUSTAINABLE EXPERIENCE DESIGN EDUCATION

The SEDE-FAN project provides a framework where various characteristics of actors and diverse contexts of respective regions are systematically represented and specific design projects can be analyzed and compared in a structured manner. This schema for *Context-Based Activity Modeling* (CBAM) (Kim and Lee, 2011; Kim et al., 2020) provides practical tools for representing design activities utilized in respective design education approaches. The activity description contains the *action verb*. The *object* of the action is specified as the object element of the activity. The *active actor* is the subject stakeholder who performs the action. In some cases, the *passive* or the *third-party actor* is specified. The *tool* can be specified if needed. A very important element of CBAM is the *context* element. The context element is described using the *goal context*, the *relevant structures*, the *physical context*, and the *psychological context* so that diverse experience issues can be addressed in human activity-centered experience design. The rich and structured manner where contexts are represented in CBAM makes CBAM form a foundation of a framework so that diverse regional contexts and various

contexts of sustainable experience activities are systematically represented as well as designing and education activities.

Note that service blueprints representing activities of designers and other collaborators have been used in understanding and interrogating design processes (Lee et al., 2013, Shimomura et al., 2015, Kim and Lee, 2021). In activity-timeline approaches, how different activities are interacting as design process is proceeded can be identified so that how different design activities are conducted for design cases. In stakeholder-timeline approaches, how different stakeholders participate and collaborate can be identified easily. The framework composed of CBAM as a structured representation of diverse activities with rich context information and service blueprint representations of such activities in various approaches is proposed in this paper in representing, analyzing and comparing sustainable experience design education efforts.

3   CASE: A CONCEPTUAL SERVICE DESIGN PROJECT

3.1   Design activities and education activities

A conceptual design project on new services for a product has been conducted as a team-based project. Three design teams have been composed so that diversity in all teams are balanced considering the student major area backgrounds and personal creativity modes (Wilde, 2009). Note that the personal creativity modes derived from the cognitive personality theory have been used in composing balanced design teams (Kim et al., 2007; Kim et al., 2011).

The three teams selected respectively a chair, shoes and a tumbler for which new service concepts are designed. Note that the three phases of *empathize*, *define* and *ideate* of design thinking (D.School, 2018) have been dealt with primarily in the project. Respective teams' focused life cycle steps have been identified after the teams went through the *empathize* phase of their service design thinking process. For the *define* phase, the teams were introduced about journey mapping and they constructed journey maps with pain points and delight points identified. The student teams iterate a little with more *empathize* activities as well as *define* and some initial *ideate* activities. Then they were asked to build As-Is service blueprints as key *define* phase design team activities.

After discussions with teams about their As-Is service blueprints, the instructor introduced a case of PSS design which contains some sustainability issue and explained the key imagining method for new services using the CBAM method. Then student teams conducted their design activities of the *ideate* phase with some iterations including *define* and *empathize* phases. With their presentations of initial service design concepts, critiquing has been done with instructions to reflect on their services further so that improvements on their service design solutions can be made. The student teams conducted their *ideate* activities further with some iterations involving the *empathize* and the *define* phase activities. The final presentations of the teams' final service design proposals were done with critiquing comments by the instructor.

3.1.1   Education activities

The activities of instructors typically include explaining of design methods and giving students opportunities to practice those methods. Such practices of design method can be done with simple review exercise efforts and with project-based applications. Particularly practices with project tasks often involve many iterations with reflection opportunities among design students and with instructors. In the case of the service design thinking course, about 90 education activities were conducted until the service concept design project was finished. They can be grouped into education activities on (1) design in general, (2) design thinking, (3) visual thinking, (4) design creativity, (5) value modeling, (6) activity design, and (7) critiquing as shown in Figure 1. Note that team-based design project started with the activity design education activities. Education activities on activity design can be grouped into eight sub-groups, (6-1) value tree, (6-2) customer journey map, (6-3) service blueprint, (6-4) context-based activity modeling, (6-5) case example of *TakeIn*, (6-6) sustainability issue, (6-7) service design process, and (6-8) case example of *Happy DIY* as shown in groups with bigger gaps with others in Figure 1. Please note that the texts in the boxes of figures can be read if enlarged in their pdf files except Figure 6

Figure 1. Education activities

3.1.2 Design activities

Design activities of student teams are grouped based on the phases of design thinking process. The design project of the course reported in this paper is for service concept design project, thus design activities are for *empathize, define* and *ideate* phases without those for *prototype* and *test* phases with additional group of *warm-up* as shown in Figure 2. Note that the basis activities of design teams are common while actual implementations of design team activities are different from team to team.

The *empathize* activities include identify requirements, identify product life-cycle steps, classify requirements as well as market and competitor research. The *define* activities are about customer journey mapping and service blueprint as shown in two columns in Figure 2. The *ideate* activities are grouped into more generic activity design and specific structured activity imagining method using CBAM as well as using some cases in devising service solution concepts. Preparing and presenting service concept proposals are also included in the *ideate* phase activities. Note that some discussion on the sustainability issue was done using a case example. Thus some teams may intend to devise service concepts addressing sustainability issue as included in the *ideate* activities. The *empathize*, *define* and *ideate* phase activities are shown in blue, green and yellow colors respectively. To distinguish different design team's behavior in terms of iterations, specific numbering of those design activities conducted in iterative and repetitive manners can be shown in each team's design process description in the form of service blueprints as in Figure 3.

3.1.3 Service blueprint of design and education activities

Student design activities of the chair team are shown in Figures 3 together with instructor's education activities in the form of service blueprints where the design teams activities are arranged on different lanes according to the corresponding phases of design thinking process. The entire service blueprint of each team has been partitioned into four sub-service blueprints. Note that the first sub-service blueprint addresses initial learning on design thinking competences and creativity issues including

exercise activities conducted individually. The second sub-service blueprint shows the initial *empathize* phase activities as well as *define* phase activities of customer journey map and as-is service blueprint of user activities. The third sub-service blueprint starts with instructor's education activities on detailed service activity design method using the case example *TakeIn* and design team's primary design activities of the *ideate* phase. Note that the case example addressed the sustainability issue. The third one finishes with critiquing on design team's presentation of their service concepts preceded by explanation of another case example *Happy DIY*. The fourth sub-service blueprint starts with design team's refinement service concept design reflecting the instructor's critique. Note that there was a review discussion session with the instructor done team by team before the design teams prepared their final service concept proposals. Note that process characteristics of each design team as shown in their respective service blueprint of design activities will be explained in the next section where each team's respective design activities and design concepts are described.

Figure 2. Design activities

3.2 Experience activities

The chair team addressed the purchase experiences of customers at a typical furniture store. Customers activities of the chair team include those on (1) awareness, (2) exploration, (3) consideration for purchase, (4) purchase and (5) use and after use as shown in Figure 4 for their initial service concepts. After critiquing with the instructor, the chair team addressed more experience activities related to the new home visit service. They are (6) booking for a home visit and related activities, (7) home visit activities, (8) refined consideration activities. Note that the stakeholder of salesperson and his/her experience activities are also important part of experience activities in the new home visit service.

The chair team's design process shown in Figure 3 can now be explained in detail. The team conducted *empathize* activities followed by some *define* and *ideate* activities initially as shown in the second sub-service blueprint. Then after instructor's education activities on structured activity imagining method together with the case of *TakeIN* as shown in the front part of the third sub-service blueprint, the chair team continued its *ideate* activities without any iteration back to *empathize* activities. But after critiquing, particularly after review meeting with the instructor as

shown in the fourth sub-service blueprint, the chair team worked on *empathize* activities followed by additional *define* activities and *ideate* activities. This last iteration of *empathize*, *define* and *ideate* activities corresponds to the new concept of home visit service. This was the key part in their final presentation.

This home visit concept may have been motivated by a new service concept of the *Happy-DIY* case introduced by the instructor. In that case, an existing service that a furniture store makes a visit to customer home after furniture delivery to make sure assembly and positioning of the furniture are suitable based on some use experiences made by customers after delivery and assembly. The key new service concept in the *Happy DIY* case is to reverse the visiting actors from store's visit to customer home to customers' visit to furniture factory. Somehow the chair team proposed a new service where a salesperson visits to customer's home before purchasing. This is to reverse the visiting actors from the case where a customer gives a visit to furniture store to the case where a salesperson gives a visit to customers' home as shown in Figure 5. In this way, the home environment which is a relevant structure of the users' activity of using the chair is fully considered with the expertise of a salesperson in recommending suitable chairs. In addition, other psychological contexts are also improved with home visit as shown in Figure 5. Due to space limitation, detailed design activities of the other two teams are not explained in the paper.
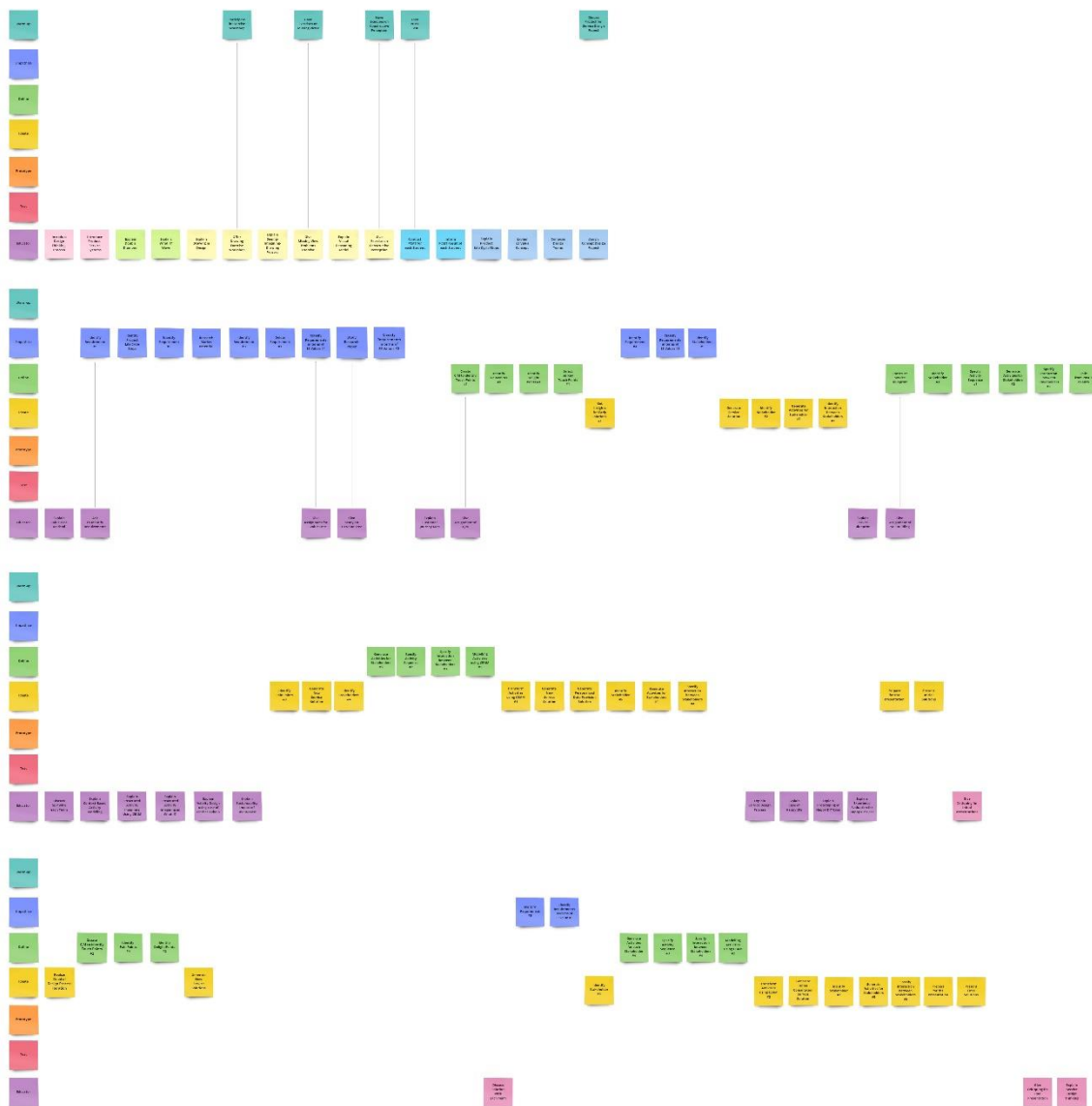

Figure 3. Service blueprint of design and education activities of the chair team

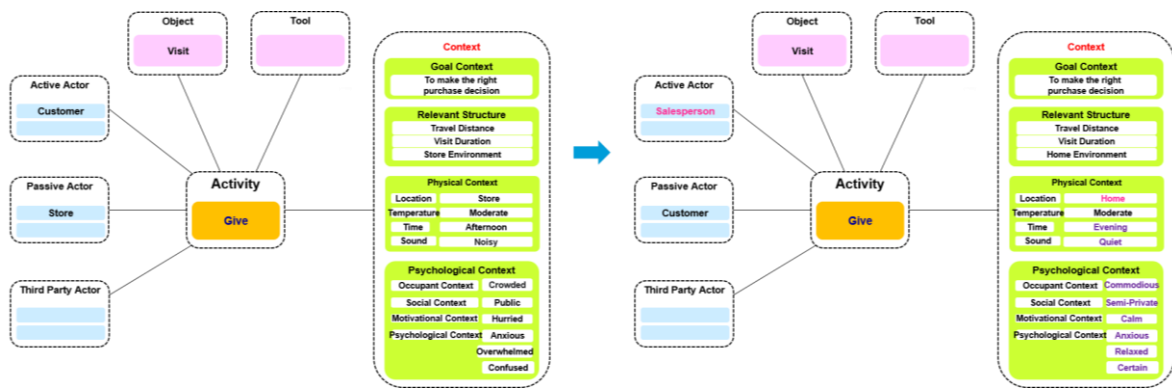Figure 4. Experience activities of customers of the chair team

Figure 5. Home visit activity by transformation of active actors

4 REFLECTIONS ON STUDENT DESIGN PROJECT

A conceptual design project on new services for a product has been conducted as a team-based project where specific service design thinking methods have been introduced as the teams have made progresses. Three design teams have been composed considering diversity of the teams.

The service blueprints of three teams' respective design activities and education activities are shown in Figure 6 together so that overall comparison can be possible for three teams. That is, those processes included as the second, the third and the fourth sub-service blueprints are shown in a single service blueprint. The chair team process shown on the top in Figure 6 has 13 *empathize* activities, 28 *define* activities, and 20 *ideate* activities. The shoes team process in the middle has 14 *empathize* activities, 26 *define* activities, and 21 *ideate* activities. The tumbler team on the bottom shows 9 *empathize* activities, 26 *define* activities, and 16 *ideate* activities. Three teams show similar number of activities for each of *empathize*, *define* and *ideate* design activities while the tumbler team has slightly fewer activities in *empathize* and *ideate* activities.

For the processes before the second partitioning point, the chair team showed 11 *empathize* activities, 12 *define* activities, and 4 *ideate* activities. The shoes team had 9 *empathize* activities, 11 *define* activities, and 4 *ideate* activities. The tumbler team conducted 6 *empathize* activities, 13 *define* activities, and 2 *ideate* activities. Note that the tumbler team had smaller number of activities in this part, but they had the most number of activities in *define*. For the processes between the second and the third partitioning points, all three teams showed different process characteristics. The chair team

showed 7 *define* activities, and 8 *ideate* activities. The shoes team had 3 *empathize* activities, 7 *define* activities, and 7 *ideate* activities. The tumbler team conducted only 2 *define* activities, and 4 *ideate* activities. The tumbler team did not conduct many activities in this part. The shoes team had *empathize* activities in this part while the other two team did not show any. This interesting aspect will be discussed further later. For the last part of their processes, the chair team showed 2 *empathize* activities, 9 *define* activities, and 8 *ideate* activities. The shoes team had 3 *empathize* activities, 8 *define* activities, and 10 *ideate* activities. The tumbler team conducted 3 *empathize* activities, 11 *define* activities, and 10 *ideate* activities. Note that all three teams did additional *empathize* activities.

While the chair team and the shoes team conducted some *ideate* activities in their initial design activities, not many *ideate* activities were conducted by the tumbler team in the initial stage with only two *ideate* activities shown at a fairly later part of the second sub-service blueprint. The other two teams showed some *ideate* activity shown early and additional *empathize* activities after such *ideate* activities. Considering that design process is co-evolution of problem understanding and solution generation (Dorst and Cross, 2001) design processes of the chair team and the shoes team may look better. On the other hand, the tumbler team may be regarded that it made their progress a little slowly.

The process characteristics shown after instructor's education activities of explaining structured imagining method using CBAM as a part of the *TakeIN* case which has some sustainability issue are more interesting. For the shoes team, *empathize* activities were conducted right after the introduction of sustainability issue. This resulted in sudden increases in the number of ecological requirements from 3 to 8. This also led to the service concept addressing sustainability. On the other hand, the number of ecological requirements for the team of Tumbler did not increase at all after the introduction of sustainability issue. Note that some sustainability issues have been already addressed properly from the beginning. This is because the Tumbler team addressed the use life cycle steps including use, wash, and repeated use experiences from their initial problem defining activities as seen in their rich *define* activities before the introduction of sustainability issue. The tumbler team conducted *define* and *ideate* activities where they used CBAM right after the introduction of CBAM.

Note that the two teams of chair and of shoes addressed the purchase/sales touchpoint while the tumbler team addressed the use life-cycle step. The final service concept proposed by the chair team addressed the home visit service where salesperson visits customer's home so that a better decision making can be made. This service is very good in that the relevant structures of the activity of using a chair include the customer's home environment where a chair is to be used and this relevant structure can be observed by a salesperson through home visit so that a better recommendation on chairs can be made by the salesperson. The home visit service includes a trade in option for the old furniture and thus sustainability issue is somewhat addressed. The key characteristic of this service is personalization supported by the home visits so that customer needs and values are better understood and personalized product recommendations can be made reflecting various context issues attainable through the home visits. Note that the team reflected their learning on CBAM and the case introduced by the instructor in their devising of the home visit by reversing the active actor of visiting from customers to salesperson exploiting the structured activity imagining method using CBAM. Note that similar reversing of active actors was used in the case of *Happy DIY* the instructor explained. This relation between education activities and the team's design activities is evidenced by the fact that the team addressed the home visit service concept after the explanation of *Happy DIY*.

The shoes team addressed also the purchase life-cycle step. Their final service concept addresses a personalization service where personalized purchase consultations can be given utilizing various data on similar customers through both in-person and on-line interactions. Note that this team completely abandoned the sustainability related service concept they proposed earlier. It is interesting to note that this team suddenly developed that sustainability service concept right after the instructor's introduction of sustainability issue by abrupt increase of ecological requirements.

The tumbler team addressed the use of a product which itself is regarded as a sustainable option compared to disposable cups with similar functions. Yet, this team addressed the key experience activity of washing a tumbler, particularly as a consumer uses a tumbler in different locations through a typical journey. In this way, reuse and washing activities were addressed in detail. Note that the team utilized the CBAM from right after its instruction in that the same activity of washing a tumbler keeps changing its CBAM representation of context information including relevant structures and psychological contexts updated properly as the location context is changing from home, office kitchen, public toilet and to a coffee shop. The final service concept includes an attempt how good experiences

are used to transform bad experiences so that the relevant structures of good experiences can be transformed to those of bad experiences. The tumbler team's service concept fully utilized context information. As the team focused from the beginning on reuse and washing, sustainability issue was addressed even before the introduction of the issue specifically in the course.
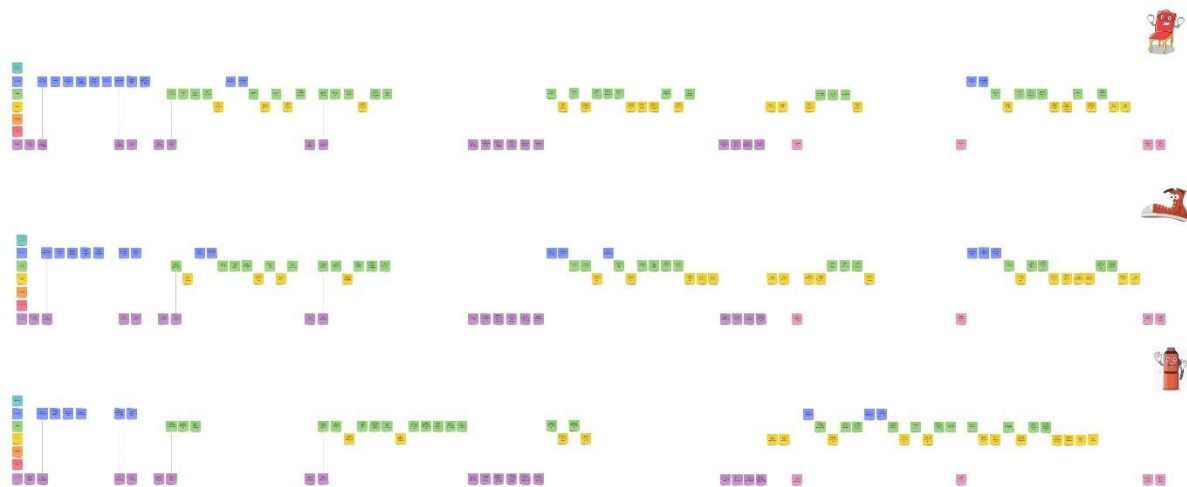

Figure 6. Comparison of design team activities

5 DISCUSSIONS AND CONCLUSION

The contribution of the paper can be discussed that the framework using CBAM representation schema of activities have been demonstrated so that detailed activity information is properly represented for experience, design and education activities. Particularly the rich and structured treatment of context information has been verified through core experience activities of two teams, the tumbler team and the chiar team, where principal design activities of the two teams effectively utilized the context representation of CBAM. Also the service blueprint representations of student teams' design activities and instructor education activities have been properly used in representing and comparing characteristics of student teams design activities in relation with education activities. In this way, the framework has been properly confirmed and presented how such experience design education efforts can be described. It is expected that those higher education institutions participating in the SEDE-FAN project has now a guide in how to report and represent their sustainable experience design education efforts using the framework.

Interactions between education activities and design activities of a design team have been represented and analyzed in this paper properly. But collaboration natures of design team members would need to be scrutinized as the immediate future work. Note that design team collaboration processes and team mechanics would need to reflect regional and cultural contexts particularly to compare sustainable experience design efforts of various institutions like those in the SEDE-FAN project.

The present research addressed student teams design activities without much considering that these students are still learning design methods. While project-based design is a desirable way for learning design, some additional concerns can be combined so that specific learning activities are intertwined with design activities. By embedding certain learning activities together with project-based design tasks, smoother learning of certain design methods could be enabled. It would also be desirable if the framework would include some reflection tools so that design learning stakeholders like students and instructors can represent and reflect design and education activities. Experiences of student designers should also be evaluated as in the case of (Onal and Sener-Pedgley, 2019).

REFERENCES

Bhamra, T., Lilley, D., and Tang, T. (2011), "Design for Sustainable Behaviour: Using Products to Change Consumer Behaviour", *The Design Journal*, 14, 427-445.
Boks, C., and Diehl, J. C. (2006), "Integration of sustainability in regular courses: experiences in industrial design engineering", *Journal of Cleaner Production*, Volume 14, Issues 9–11, Pages 932-939.

Ceschin, F. and Gaziulusoy, I. (2016), "Evolution of Design for Sustainability: from Product Design to Design for System Innovations and Transitions", *Design Studies*, 47, 118 – 163.

Dorst, K., and Cross, N. (2001), "Creativity in the Design Process: Co-Evolution of Problem–Solution", *Design Studies*. 22 (5): 425-437.

D.School, (2018), *Design Thinking Bootleg*, https://dschool.stanford.edu/resources/design-thinking-bootleg.

Goedkoop, M.J., van Halen, C.J,G., te Riele, H.R.M. and Rommens, P.J.M. (1999), *Product Service Systems, Ecological and Economic Basics*, the Dutch ministries of Environment (VROM) and Economic Affairs (EZ).

Kim, M.S., Kim, Y.S., and Kim, T.H. (2007), "Analysis of Team Interaction and Team Creativity of Student Design Teams Based on Personal Creativity Modes", *Proceedings of the 19th International Conference on Design Theory and Methodology*, September 4–7.

Kim, Y.S., and Hong, Y.K. (2019), "A Systematic Method to Design Product-Service Systems Using Personalization Services based on Experience Evaluations", *International Journal of Product Development*, 23 (4), pp.353-385.

Kim, Y.S. and Lee, S.W. (2011), "Service Design for Product-Service Systems using Context-Based Activity Modeling", *International Association of Societies of Design Research (IASDR) Conference*, Delft.

Kim, Y. S., and Lee, H. (2021), "Process Characteristics of Product-Service Systems Development: Comparison of Seven Manufacturing Company Cases", *Journal of Cleaner Production*, Vol.286. 1 March 2021, 124971.

Kim, Y.S. and Park, J.A. (2021), "Design Thinking in the Framework of Visual Thinking and Characterization of Service Design Ideation Methods Using Visual Reasoning Model", *The Design Journal*, Vol. 24, Issue 6.

Kim, Y. S., Kim, M. H., and Jin, S. T. (2005), "Cognitive Characteristics and Design Creativity: an Experimental Study", *Proc. ASME Conf. Design Theory and Methodology*, Long Beach.

Kim, Y.S., Shin, J.H., and Shin, Y.K. (2010), "Conceptual Design and Cognitive Elements of Creativity: Toward Personalized Learning Supports for Design Creativity", In: Taura, T., Nagai, Y. (eds) *Design Creativity*, 2010. Springer, London.

Kim, Y.S., Hong, Y.K., Kim, J.H. and Kim, Y.M. (2011), "Context-Specific Experience Sampling for Experience Design Research", *International Conference on Engineering Design* (ICED11), Copenhagen.

Kim, Y.S., Jin, S.T., and Lee, S.W. (2011), "Relations between Design Activities and Personal Creativity Modes", *Journal of Engineering Design*, 22:4, 235-257.

Kim, Y. S., Jeong, J. Y., Hong, Y. K., and Hong, S. J. (2020), "A Schema for Systematic Service Imagining: Context-Based Activity Modeling", *Sustainability*, 12(22).

Kim, Y.S., Lee, S.W., Jeong, H., Kim, S.R., Kim, J.H., Noh, J.H., and Won, J.H. (2013), "A Systematic Design Framework for Product-Service Systems and Its Implementation", *International Conference on Service Science and Innovation*, Kaohsiung.

Lee, S.W., Lee, J., Jo, N., Kim, Y.S. (2013), "Design Activity and Team Interaction Characteristics: a Case Study of Protocol Analysis on Team-based Product-Service Systems Design Processes", *International Conference on Engineering Design* (ICED13), Seoul.

Önal, N.F., and Şener-Pedgley, B. (2019), "Using a Self-Reporting Tool to Capture Design Student's Experience", *DRS International Conference for Design Education Researchers*.

Pine, J.B. II, and Gilmore, J.H. (1998), Welcome to the Experience Economy, *Harvard Business Review*, 97-105.

Shimomura, Y., Nemoto, Y., and Kimita, K. A. (2015), "A Method for Analysing Conceptual Design Process of Product-Service Systems", *CIRP Annals – Manufacturing Technology*, Volume 64, Issue 1, pp.145-148.

Tukker, A. (2015), "Product services for a resource-efficient and circular economy – A review", *Journal of Cleaner Production*, 97, 76-91.

Vargo, S. L., and Lusch, R. F. (2004), "Evolving to a New Dominant Logic for Marketing", *Journal of Marketing*, 68, 1-17.

Wilde, D. J. (2009), *Teamology: the Construction and Organization of Effective Teams*. London: Springer.