INVESTIGATION OF THE LEARNING PROCESS IN A RECURRENT EDUCATION PROGRAMME WITH DESIGN AND ART THINKING

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ABSTRACT
Recurrent education attracts a lot of interest these days. However, it is unclear how working adults in recurrent educational programmes gain learning in the experience. Thus, this study aims to clarify the learning process by adopting the proposed framework for analysis. The "*LAD (Learning Acquisition and Depth) framework*" was developed based on Kolb's experiential learning model and Reflection Intensity framework by Hartmann et al. to enable the investigation of the learning process and depth by analysing participants' reflections. The recurrent educational programme employing design and art thinking was targeted, and semi-structured interviews with four participants were conducted. The proposed framework could visualise the learning process into four reflection levels and structure the link among small learnings. In addition, the result also implies that the current framework needs to incorporate the participants' learning within their workplaces to holistically understand the process, which might be unique to the recurrent education. This study could contribute to understanding the learning process and improving the educational project-based programmes.

Keywords: Entrepreneurship, design education, lifelong learning, professional development, reflection

1 INTRODUCTION
Rapidly changing market conditions require companies to launch new products and services, which in turn requires the development of entrepreneurship among employees. Thus, entrepreneurship education is becoming increasingly important in the context of recurrent education. Entrepreneurship is defined as *"a transversal competence that applies to all areas of life, from fostering personal growth to active participation in society, returning to the workplace as an employer or self-employed person, and even starting a business"* [1]. European Commission created a framework of entrepreneurial competencies consisting of 15 competencies, including creativity, vision, self-efficacy, and working with others [1]. Design thinking and art thinking have positively influenced entrepreneurship education because design thinking fosters creativity, problem-solving, and iterative trial-and-error skills [2], and art thinking focuses on finding and facing issues that are important to oneself [3]. Although the learning effect is frequently measured through questionnaires [4], there is insufficient evaluation of the learning process to clarify the factors that contribute to learning outcomes. Some studies evaluate the learning process in design education for students [5], but they are not in the context of recurrent education. It is still unclear how professionals gain lessons through a recurrent education programme on entrepreneurship using design and art thinking.
Therefore, this study aims to investigate the students' learning process in the *Intensive module* and *Art Thinking module* through a questionnaire and a series of semi-structured interviews. A framework for analysing learnings that students gain from specific experiences during the programme was developed, and learning experiences were structured based on interviews. This paper reports on learning and reconstructing learning from the design and art programmes through case studies of interviews and questionnaires.

2 LAD FRAMEWORK
We propose an analytical framework, "*LAD (Learning Acquisition and Depth) framework*", to investigate participants' learning in recurrent education. The need for a new analytical framework arose because it was necessary to simultaneously elucidate both the process and depth of learning acquisition

based on participants' reflections. Existing frameworks in prior research often represent practitioners' thoughts and actions as stages or steps, modelling the learning process that occurs through practical experience. However, when applying these existing frameworks to survey responses or interviews where practitioners reflect on their experiences in a programme, limitations arise.

For instance, one of the most well-known models, Kolb's experiential learning model [6], consists of four categories—*Concrete experience*, *Reflective observation*, *Abstract conceptualisation*, and *Active experimentation*—modelling learning through experience. While this model has significantly contributed to the field, it has also been widely criticised for issues such as its conceptual positioning and the ambiguity of its classification criteria (see, for example, Bergsteiner et al. [7]). These challenges make direct application for analysis difficult. Similarly, in Tessier's [5] study on the learning process in design projects, the expansive learning model [8] was employed. This model consists of seven stages: *Questioning*, *Analysis*, *Modelling the new solution*, *Examining and testing the new model, Implementing the new model*, *Reflecting on the process*, and *Consolidating and generalising the new practice*. The model shows a learning cycle in which practitioners take transformative actions in response to situational challenges or conflicts, leading to their stabilisation. However, since this model focuses on behavioural transformation, a problem occurs when applied to data where subjects describe past experiences through reflection.

Despite these challenges, these learning models provide valuable insights into how practitioners acquire knowledge. Therefore, we developed a framework based on these models that allows the classification of statements according to the way individuals reflect on their experiences. The "*LAD framework*" consists of four categories, and these categories indicate the stages in which individuals process experiences and acquired knowledge until they internalise them as lessons while also representing the maturity level of their learning.

This framework not only illustrates how individuals progress through the learning process but also reveals the depth to which they engage with acquired knowledge and experiences. This corresponds with the concept of reflection intensity proposed by Hartman et al. [9]. The reflection in design process is essential to learn lessons and improve the process, and have been studied many years (e.g., [10], [11], [12]). There are various frameworks, however, Hartman et al. focused on teams' practice and extend existing frameworks. In their work, they categorised reflection into four levels: *Revisiting*, *Descriptive reflection*, *Dialogic reflection*, and *Critical reflection*. *Revisiting* clarifies past experiences, while *Descriptive reflection* explains them based on prior knowledge. *Dialogic reflection* entails exploring multiple perspectives and connecting new knowledge. In contrast, *Critical reflection* involves questioning assumptions and critically examining existing beliefs and values in preparation for action. While Hartman argues that higher reflection intensity is not necessarily better [9], our framework integrates this concept into the learning acquisition process, aligning it with learning maturity. By employing this framework in qualitative content analysis, we aim to elucidate both the learning process and the depth of learning within the programme.

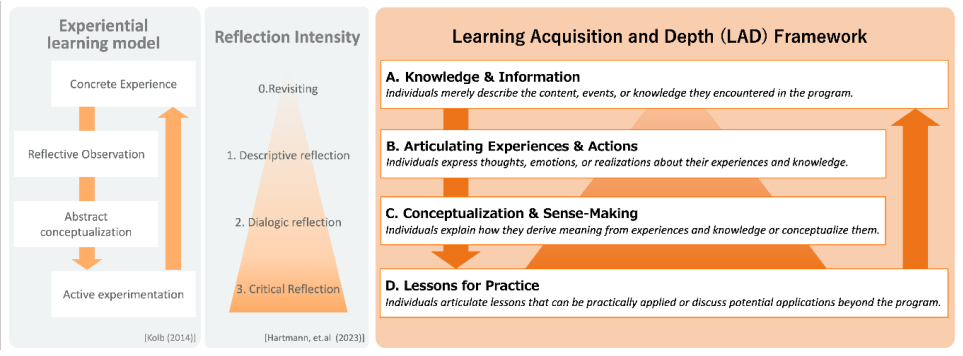

Figure 1. LAD framework and relation with existing theories [6], [9]

3 METHOD

This study evaluated a recurrent educational programme targeting working adults with a background in engineering or design in their higher education. The programme consists of four modules: a 2-day Intensive module, a 6-day Art thinking module, a 4-month Design thinking module, and a 2-day *Foresight module*. The programme offers opportunities to collaborate within a multidisciplinary team

not usually formed in the participants' workplace. This study focuses on the first two modules, the intensive introductory course and art thinking. Table 1 shows a summary of the two modules. L, P, and T, within the brackets in Table 1, show the styles of the course: lecture(L), practice(P), and team activities(T). There was a total of nine types of content that changed the learning: three from the intensive introductory course and six from art thinking, all of which included practice in team activities. The 2-day intensive module aims to introduce basic knowledge and practice design thinking quickly. Firstly, the basic concepts of art thinking and design thinking were introduced. Then, the participants were divided into four teams of four participants and conducted design thinking approaches with collaborative work. The art thinking module consisted of four lectures. The first lecture included two online video courses on aesthetics and creativity in business. The second lecture was a perspective-setting workshop and consisted of lecture videos and online lectures. The third lecture consisted of two online video classes and one online feedback session to develop skills for visualising ideas. The fourth lecture consisted of two in-person sessions, instructing an approach to connect the art thinking approach to the participants' regular work. Through the art thinking module, the participants were expected to learn the skills and mindsets to visualise their ideas and visions for the future and gain insight into how to connect the questions posed by artworks with their own professional tasks.

Table 1. Content of the programme (L: Lecture, P: Practice, T: Team-based activities)

Intensive module		***Art Thinking module***	
I1	Design Thinking Mindset (L)	**A1**	Sketching for communication (L, P)
		A2	Organising & discovering values (L, P)
I2	Interview Practice (P, T)	**A3**	Sketching of one's desired image of society (L, P, T)
		A4	Verbalising habitual thoughts & emotions (L, P)
I3	Problem definition & Framing (P, T)	**A5**	Exploring possibilities through questions from artworks (P, T)
		A6	Imagining the future with creative questions (P, T)

The data was collected during the programme in 2024. The participants of the year were 16 people aged 27-46, 11 with engineering backgrounds and five with design backgrounds. Brief free-format questionnaires and semi-structured interviews were conducted to analyse the participants' learnings. The short free-from questionnaire was conducted after the module to leave their thoughts or feelings as clearly as possible. The questionnaire aimed to investigate the changes in participants' mindsets. The questionnaire was conducted two times to monitor the change: before the start of the programme and after the *Art Thinking module*. This questionnaire consisted of 43 questions involving 31 questions from Design Thinking Mindset Questionnaire [13] and 12 questions created based on Entre Comp [1].

The semi-structured interviews aimed to reveal the learning process of the participants. The one-hour interviews were conducted with four participants, two with engineering backgrounds and two with design backgrounds, aged 27-35. Interviews were conducted within one month after the end of each module. The first and second authors conducted all interviews. These interviews were structured using the "*LAD framework*" to facilitate reflection and externalisation of learning. The examples of questions were "What was your most memorable moment in your manual work?" and "What insights did you gain compared to your usual practice?". All interviews were recorded and transcribed for analysis. The qualitative content analysis methods [14] were employed, and the first author conducted all analyses. First, all transcriptions were read through, and segments related to the framework were extracted: A. *Knowledge and Information,* B. *Articulating Experiences and Actions,* C. *Conceptualisation and Sense-Making,* and D. *Lessons for Practice*. Second, all extracted segments were paraphrased to shorten and highlight the points. Third, the paraphrased sentences were coded inductively to get the learning categories. The sentences were checked to see whether they fit existing categories or not, and if there were no suitable categories, new code was generated. By repeating coding tasks, categories were integrated or divided until the level of abstraction was considered reasonable. Fourth, the first, second, and third authors discussed the categories, and their definitions based on the preliminary analysis until all agreed on their reliability. Fifth, all paraphrased sentences were mapped to represent the connections between the different items of the framework. Finally, the programme contents related to the A. *Knowledge and Information* were identified, and the whole qualitative analysis was finished.

4 RESULT AND DISCUSSION

4.1 The quantitative evaluation of the learning

Figure 2 shows the mean values of the quantitative evaluation of the learning. We could not find a significant difference in all categories, while there is a small difference between the two data.

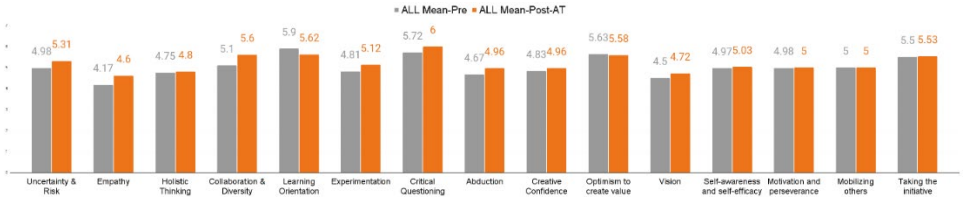

Figure 2. Changes of quantitative learning evaluation (before programme vs after art thinking module)

4.2 Structure and Types of Learning

Figures 3 shows the analysis results of the participants' learning process using the "*LAD framework*". In the figure, a box shows a quote from the interviews, and arrows visualise the link between boxes and quotes from the interviews. The figure illustrates two examples: the case on the left (C1) includes quotes corresponding to all four stages, whereas the case on the right (T1) includes quotes corresponding only to the first two categories. C1 reflected on the collaboration within the programme and its connection to his daily work, realising the potential to further develop value through cooperation with individuals with different perspectives. This recognition led to the lesson that leveraging such diversity is crucial. In contrast, T1 noticed the differences in how designers and engineers operate but does not seem to have fully internalised this experience. Through applying this framework, the learning acquisition process and its depth became evident.

Table 2 shows a summary of the learnings extracted from the interviews. The learnings were categorised into eleven small learning through the nine programmes. In Table 2, T/C is the number of people who reported each learning; in the Lecture column, each learning was related to the programme content in Table 1. Some learnings, for example, cross-value collaboration, were related to multiple programme contents.

The learning of *"Cross-value collaboration"* was learned in both modules. It implies that the learning gained in the introductory intensive module was reinforced by the art thinking module. A participant mentioned that he could learn his own sense of values by collaborating with people from industries in which he did not communicate within his workplace. The collaboration allowed him to be aware of his team members' value and to respond to unexpected team members' reactions. In the art thinking module, the participant learned how to draw a vision that attracts people and witnessed the reactions to the vision created from his own values. The participants learned how to better communicate their values to others in collaboration with people with different values.

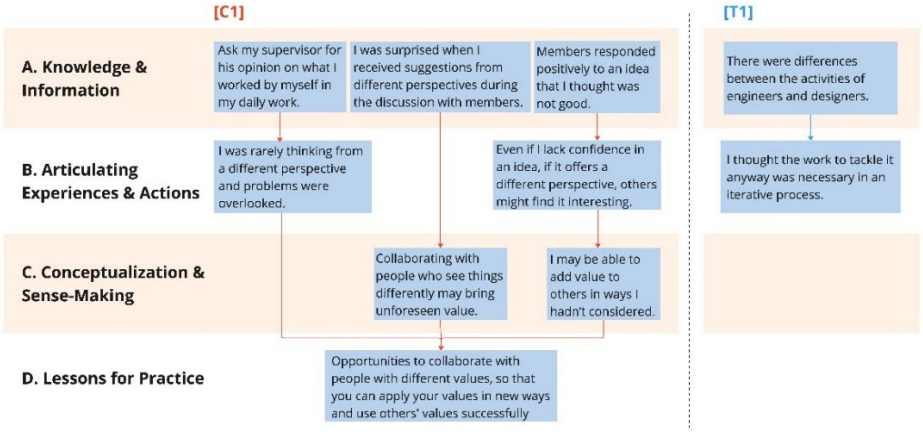

Figure 3. Analysis results of the participants' learning process

Table 2. Categories of learning and related programme contents (T: Engineer, C: Designer)

Types of Learning	**Definition** ~ *quote from interview*	T/ C	Lecture
Uncovering latent needs	**Learning how personal, specific episodes reveal latent needs** *~ I realised that interviews are not just about asking a set list of questions and checking them off [T1].*	2/2	I2, I3
Reading between the lines	**Learning to anticipate problems using interview insights and frameworks for problem definition** *~Rather than overthinking, I found that empathising with users and questioning why they think a certain way often leads to insights and new perspectives. I want to carry this mindset into my daily work [C1].*	1/2	I2, I3
Failing fast	**Learning to rapidly prototype and iterate processes** *~ I rely on logic to move forward. (... I found) process like design thinking—where you just try things even in uncertainty—is essential [T1].*	2/0	I3
Sharing thinking	**Learning the value of sharing ideas in the trial stage** *~I realised that when deciding how to proceed with a project at work, sketching a lot and exploring different ideas is crucial [T1].*	0/1	A3
Cross-value collaboration	**Learning to understand and leverage diverse perspectives in teams** *~The approach of 'just trying something out' seems essential in design thinking, where the process isn't strictly linear (which I used to do in my daily work) but involves going back and forth [T1].*	2/2	I2, I3, A3
Overcoming unconscious bias	**Learning to use role-playing and prototyping for broader perspectives** *~When creating a role-play scenario, I hadn't thought much about how to effectively convey the message, but I realised that considering this perspective is crucial in generating ideas [T2].*	1/1	I3
Visualising thoughts	**Learning to visualise and share ideas with others** *~Learning about the importance of visual communication made me realise that proposals (in daily work) should incorporate visuals [C2].*	2/2	A1, A2, A3
Backcasting mindset	**Learning to work backward from the future to guide present actions** *~Art Thinking module seems highly applicable to how we frame questions when setting themes for research & service development in work [C2].*	0/1	A3
Crafting an attractive vision	**Learning to express and communicate an inspiring societal vision** *~ (...) the comments on sticky notes from others about my vision sketch, I clearly understood that not everyone will fully agree with my vision [T2].*	1/2	A2, A3
Refining aesthetic sense	**Learning to explore values and identity through aesthetic sense** *~ I realised that I actually have many thoughts of my own, and it reinforced my determination to pursue what I truly want to do [T2].*	2/2	A2, A3, A4
Gaining a macro perspective	**Learning to broaden perspectives through self-generated questions inspired by art** *~By reflecting on both the questions posed by the artwork and my own questions, I came to see art as something that reveals the deeper questions that exist in the world [C2].*	2/2	A5, A6

4.3 Barriers to Learning for Working People

An engineer struggles to link the sense of values formed through her workplace practices with the learning through the modules. The participant learned that qualitative deep interviews could lead to latent needs and that she applied the lessons in her work. The following quote implies that the participant thinks interviews can help uncover the needs of mentees.

"I learned that an interview is not at all just about asking a set of questions and getting a check. […] I ask specific episodes on the trainer's role of human resource development in my work. [T2]."

On the other hand, the participant learned a lesson that desk research of trends is crucial to finding problems through her work experience. The value is too strongly etched in her mind by her past failure

experiences. As a result, she found online research was more important than interviews, which was the complete opposite of the module's expected learning that the in-depth interview is a key for the success.

"In my work, a service which I had developed with interacting with a customer was not used. I participated in this programme to learn how to think about creating valuable services. […] Interviews are about personal thoughts, so you have to research trends in the world [T2]."

The participant found the power of the interviews but misunderstood that interviews could only elicit the thoughts of an individual, an interviewee. The result implies that barriers may exist in translating learnings into usable lessons when the lessons differ from the values professionals have formed in their daily work. The current proposed framework cannot visualise such influence because the framework focuses on the students' experience and learning within a programme.

5 CONCLUSIONS

This study investigated the learning process in a recurrent education programme through the proposed framework to visualise the learning. The results showed that the framework could visualise the learning process into four reflection levels and structure the link among small learnings. The result also implies that the current framework needs to incorporate the participants' learning within their workplaces to holistically understand the process, which might be unique to the recurrent educations.

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