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**A Learning Environment to Promote  
Awareness of Experiential Learning Process  
with Reflective Writing Support**

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Japan Advanced Institute of Science and Technology

Doctoral Dissertation

A Learning Environment to Promote Awareness  
of Experiential Learning Process with Reflective  
Writing Support

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Knowledge Science

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## Abstract

Experiential Learning (EL) is learning through experience, which consists of four processes of learning. EL views it as an integrated cyclic process in which each stage is supportive of the other. First, Concrete Experience (CE) is the learner involved in the experience and followed by Reflective Observation (RO) is the stage of reflecting on one's experience. Then, Abstract Conceptualization (AC) is the stage of creating a theory to explain the observation. Lastly, Active Experimentation (AE) is the stage to use the idea created and apply it to future changes. However, EL is challenging to learn as the learner must all achieved four abilities: able to actively participate in the experience (CE), able to reflect on the experience (RO), able to possess and use analytical skills to conceptualize the observation (AC), able to use decision making and problem-solving skills to make a strategy to use new ideas gained from experience (AE). This research introduces a learning environment to promote the awareness of the EL process by reflective writing support framework as the primary method for the learner to learn EL. In the beginning, most learners cannot verbalize what they learned through EL well; thus, they use shallow thinking for reflective writing. To solve EL difficulties, we design purposeful learning support functions and their observation. The orientation program is a short lecture to introduce EL concepts and motivate them to learn EL through the framework. The user interface of reflective writing framework design connects four EL processes with input and output that is easy to understand EL concepts' integration. The sentence opener function has dual roles in supporting reflective writing by promoting deep thinking on EL concept understanding and observing the learning behavior is designed. Learners think about using the sentence starters to learn EL concepts from various options to learn keywords and sentence structure and integration of EL concepts. These sentence starters are thinking representation and observable objects as well. The learner thinks more carefully by using the hint role of the sentence openers. We designed the learning sensor role of the sentence openers to track the learning events that the learner interacts with the system. The captured sensing data will be interpreted and explicitly sensed the meta-level thinking process of the learner by the visualization platform. The mentor support function also supports the encouragement, admiration, and feedback sentences to promote and motivate the learner based on their learning model. We examine in two environments 1) twelve weeks internship and 2) the ten-week distance learning experience. The results and discussion show how the design framework of dual usage of implicit thinking support and observation can be generalized to a similar learning environment.

**Keywords:** Experiential Learning, Knowledge Science, Self-Regulated Learning, Reflective Writing, Metacognition

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## **Glossary and Terminology**

<b>Glossary</b>	<b>Terminology</b>
EL	Experiential Learning
SRL	Self-Regulated Learning
WBL	Work-based Learning
CE	Concrete Experience
RO	Reflective Observation
AC	Abstract Conceptualization
AE	Active Experimentation
DL	Distance Learning
SO	The Sentence Openers
MSS	Metacognitive Skills Scale
LBP	Learning Behavioral Patterns
LG	Learning Goals
TG	Technological Goals
UI	User Interface

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# Chapter 1

## Introduction

Higher education institutions incorporated experiential learning in their curriculum to help students achieve intellectual goals among academics and industry (Simons et al., 2012). Kolb (1984) proposed a learning theory, Experiential Learning (EL), that focuses on learning from experience. EL is defined as “the process of learning whereby the knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience”. EL focuses on the process of learning more than the product of learning (Kolb, 1984; Itin, 1999). EL is essential for learner’s individual development to gain knowledge for their employability skills. EL can help the student become the ‘career-ready’ graduate and suggest the educational institution should consider long-term alternatives by integrating a range of different learning opportunities that focus on workplace involvement (Spanjaard et al., 2018). Kolb also suggests that the potent EL of a learner only occurs when all four stages of the model are all executed. Thus, in order to gain meaningful knowledge from experience, the learner must have four abilities based on Kolb, 2015 are:

1. Involving themselves fully, openly, and without bias in the new experiences (CE).
2. able to reflect on and observe their experiences from many perspectives (RO).
3. able to create concepts that integrate their observations into logically sound theories (AC).
4. able to use those theories to make decisions and solve problems (AE).

A critical ability of EL, ‘Reflection’ has gained increasing attention in theory, practice, and education as it has been extensively researched and theorized (Van Beveren et al., 2018). Reflection, as Schön (1983) defines, is divided into two main categories: reflection-in-action as an epistemology of practice that recognizes the value of knowledge gained through experience. Alternatively, reflection-on-action involves looking back after the event has occurred (Larrivee, 2000). Reflection is believed to be the way to change in action; however, reflecting on experience alone is complicated and needs to be guided in order to fulfill learning potential (Toom et al., 2015; Boud et al., 1985)

The necessary condition of the internship to be a well-guided experience is to form the appropriate relationship among all stakeholders includes the learner, the university, and the firm contributes to the success of the experience (Brown et al., 2018)

## 1.1 Background of the Research

In this study, we select a Thai private university that has a unique internship program. The uniqueness includes a long internship period of three months to nine months long, with multi-phase training. The learner participates in the extensive internship program, as shown in table 1.

Phase	Study Year	Semester			
		1.1 Aug-Nov	1.2 Nov-Feb	2.1 Feb-May	2.2 May-Aug
I	1 <sup>st</sup>	Study	Study	Internship	Study
II	2 <sup>nd</sup>	Study	Internship		Study
III	3 <sup>rd</sup>	Study	Study	Study	Internship
	4 <sup>th</sup>	Internship			Job Placement

Table 1.1 The Curriculum of Internship program in a Thai University

As the curriculum integrates with the long period of the internship, they are involved with multiple stakeholders such as mentors, companies, and faculties. In a different phase of the internship, the learner may experience various learning activities with different mentors' levels to support learning, various companies with different working environments. The learner expects to learn career skills through the internship. Unfortunately, most learners cannot make good reflection and cannot learn how to learn from experience. Thus, Experiential Learning (EL) support is needed for all parties.

Experiential Learning (EL) by Kolb is the process of learning through experience, which consists of the four stages cycle of learning, as in figure 1. Learning can be viewed as an integrated cyclic process, with each stage being supportive of each other being continuously created and recreated (Kolb, 1984).

First, Concrete Experience (CE) is when a learner has a concrete experience then learner observes and reflects on that experience as Reflective Observation (RO), which lead to Abstract Conceptualization (AC), which is the analysis and conclusions on what the learner experienced and lastly Active Experimentation (AE) is when the learner applies what have learned in next chances.

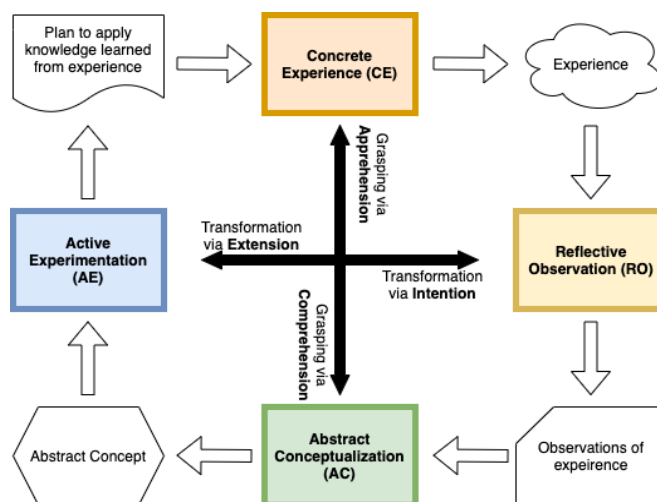


Figure 1.1 The Kolb's experiential learning cycle (modified from Kolb's experiential learning cycle)

## 1.2 Research Motivation and Problem Statements

One of the essential abilities of EL is Reflection, as it is the way for learners to recognize the value of knowledge gained through experience. Reflective writing is one of the learning methods to learn EL concepts.

In this research, the multi-phase internship settings where the learner participated in multiple internship phases from their first year, second year, and fourth year. The internship is the crucial learning process that provides a unique experience to integrate what they learn in the university with the real work environment. As the curriculum of the selected private university in Thailand, Panwapiwat Institute of Management (PIM), integrated with the multi-phase and long internship period, they involved multiple stakeholders such as mentors, companies, and faculties. In a different phase of the internship, the learner may experience various learning activities with different levels of mentor support in EL, also various companies with different working environments. The learner expects to learn career skills through the internship. Unfortunately, most learners cannot make good reflection as they cannot make their learning explicit and cannot learn how to learn from the experience.



Moreover, the learner cannot integrate EL concepts as the experience plays a central role in the learning process that requires integrating all EL processes.

During the COVID-19 situation around the world, it is difficult to learn on-site. This is also lead to our idea to use in the distance learning setting as well.

Several works were conducted to support EL with reflective writing in the internship, nurse practice, sports, and more. However, most of them lack support on EL concepts' thinking, the support of recursiveness of the experience, the integration of EL concepts, and cannot track how the learner think.

### 1.3 Research Objectives and Scopes

In this research, we aim to achieve “**RG:** To design and develop a learning environment to promote awareness of the experiential learning process by through reflective writing support” with the following sub-goals:

- **SRG1:** to support thinking by reflective writing support by provide hint, guide to write to promote metacognitive thinking in EL and enable learning observation
- **SRG2:** to provide support for teachers or mentors as an observation interpretation of thinking behavior of the learner

### 1.4 Contributions and Originalities

#### 1.4.1 The unique points of this research

The unique points of the research aimed at the following novelties:

- In this research, a learning environment to support the learning of Experiential in the multi-phases and long-period of the internship program with an in-depth analysis of how the learners learned and changed from EL's implicit development.
- The learning environment is designed to support the development of EL of the learner. The primary teaching method is to promote thinking by writing support, which promotes deep thinking by using language expression.

- The dual roles of the sentence openers function to provide HINT to learn and at the same time as LEARNING SENSOR to capture the implicit learning behavior and make it explicit by visualization platform.
- The web-based system enable observations between learner-learner. This give co-creation between learners.

## 1.5 Expected impact of the research

The contribution to Knowledge Science is that we defined a model that supports the learning process of EL by supporting the verbalization of reflective writing using the sentence openers function. There is an interplay between language and understanding of subject matter as language is a medium of thought. Language has traditionally been viewed as a vehicle of thought that aids in cognitive processing. The reflective writing activity assisted by the sentence opener function plays a critical role in language expression to support reflective thinking as it is the evidence of reflective thinking and is a process that describes thinking about one's own thinking and behavior and the potential for generating knowledge. The data interpretation from learning sensors helps us understand how the learner learned EL concepts as the learning sensors can track fine-grained data to track change, so we understand how the learner learned.

A learning model from this research intends to enhance the learning and development of Experiential Learning (EL) concepts that benefit the learners themselves and the company for better employability and ready to work. Moreover, this work promotes the development of the learner's deep thinking that will lead to better personnel that served the country better.

## 1.6 Organization and Contents

This dissertation has organized the structure and contents into six chapters. The overview of each chapter is briefly described as follow:

**Chapter 2: “Background”** introduces the theoretical background used as the main starting point in this work, such as Experiential Learning (EL) and related concepts. As well as the related literature

**Chapter 3: “Pilot Study: Web-based Learning Environment”** introduced to the pilot study that investigated the EL competencies of the learner and the current EL learning situation in the internship program. The background of the internship program is also discussed. We developed the prototype

system to promote EL concepts based on the learning goals we found during the pilot study. In this pilot study, EL difficulties and challenges are defined. Findings from the pilot study point out that thinking support by verbalized support of reflective writing on EL concepts is needed.

**Chapter 4: “Experiential Learning Framework”** In this chapter, we explained how we designed the EL framework along with the learning goals of EL.

**Chapter 5: “Experiential Learning Environment Design”** In this chapter, the learning environment to support EL is designed. This is the primary goal of this research, where learners need to learn EL by practicing metacognitive thinking.

**Chapter 6: “Exemplifying Experiential Learning in Learning Environment”** the demonstration on how the learner learn through the learning environment.

**Chapter 7: “Conclusions”** the conclusion of this dissertation from the first chapter to this chapter is presented. We remark the limitation and recommendation for the suggestion of further study.

# Chapter 2

## Background

### 2.1 Introduction

In this chapter, the theoretical background knowledge on the related topics is introduced. The experiential learning (EL) theory and the related topics such as Self-Regulated Learning (SRL), Metacognition are discussed in this chapter. The related research on EL topics is discussed with the current research trend. We discussed the importance of EL and the difficulties of EL. Finally, we remark on the research challenges and limitations of the current approach.

### 2.2 Theoretical Background

#### 2.2.1 Experiential Learning (EL)

In this study, Kolb's Experiential Learning (EL) theory serves as the foundational theory. It describes learning as the process of creating knowledge by changing experience, and that knowledge is the product of the combination of comprehending and transforming experience (Kolb, 1984, p. 41). The EL is a knowledge generation process that involves four learning processes: concrete experience (CE) and abstract conceptualization (AC) techniques of comprehending experience, as well as a process of generating knowledge. Furthermore, two strategies of experience transformation - Reflective Observation (RO) and Active Experimentation (AE) - are used (Kolb & Kolb, 2005)

Experiential Learning is a recursive process that is referred to as "recursive thinking" in this study because what is learnt from previous experiences is a continual process that is used in future settings, and all learning is relearning. As a result, the EL cycle is a four-step or sub-process.

## 2.2.2 The Structural Dimensions of Experiential Learning (EL)

Two primary structural dimensions of the learning process as in figure 1.1:

- Prehension dimension – the process of taking in information
  - Grasping via apprehension - direct apprehension of immediate concrete experience, knowledge of acquittance, Reality, Know instantly without analytical confirmation
  - Grasping via comprehension – a reliance on conceptual interpretation, indirect comprehension of symbolic representation of experience, knowing, knowledge-about
- Transformation dimension – How individuals interpret and act on that information
  - Transform via intention – Intentional Reflection
    - Understand of immediate CE by reflecting on their pre-symbolic impact on our feelings internally.
  - Transform via extension
    - The new implication can be actively tested (via an action(s)) and serve as guides in creating a new experience
    - By acting on our anticipated experience and thus broadening it.

The importance of structural dimension is that learning necessitates the resolution of conflicts between dialectically opposed modes of world adaptation (Gavin Beever, 2016). Furthermore, the learning level is determined by how conflicts between dialectically opposed modes of adaptation are resolved. In this research, we used this idea to construct support function to support of grasping and transforming of experience. As a result, in order to progress from one phase to the next, the Transition between:

- (CE → RO) Divergent knowledge is created when a person grasps experience through apprehension and transforms through intention.
  - Direct or concrete experience as the basis for observations and reflection.
  - Divergent thinking desires multiple perspectives and solutions to problems and questions.
- (RO → AC) Assimilative knowledge is created when experience is grasped through comprehension and transformed through intention.
  - The reflection is assimilated (absorb) and distilled (extract the essential) into abstract concepts.

- When a learner encounters a new idea, they must 'fit' that idea into what they already know, which is known as assimilation of knowledge.
    - Consider it as filling existing containers.
- (AC → AE) Convergent knowledge is created when a person grasps through comprehension and transforms through extension.
  - The new implication for action can be drawn
  - Convergent thinking holds that there is only one correct answer to a question and one solution to a problem.
- (AE → CE) Finally, accommodative knowledge emerges when one grasps experience through apprehension and transforms it through extension.
  - The new implication can be actively tested and used to guide the development of new experiences.
  - Accommodation of knowledge is more substantial (concerning the essentials of something), requiring the learner to reshape those containers.

### **2.2.3 Metacognition**

Metacognition refers to the knowledge and cognition about cognitive phenomena is important aspect in this research is that it is based on the process of thinking of own thinking. Then, it can be considered as valuable skills in EL as helps learners to become self-aware of their experiential learning process. It is included, Metacognitive knowledge refers to the knowledge or thoughts about what factors act to influence the causalities and product of cognitive processes; the factors include person, task, and strategy. In this research, metacognitive experiences are provided, these experience occur in circumstances that prompt a lot of control and regulation of their thinking, such as in a job or school task (Flavell, 1979). To obtain the learning at the desired level is no easy task for novice learners to gain metacognitive skills without having metacognitive experience (Duangnamol et al., 2018). It is crucial to improve learners' metacognitive skills. Learners with advanced metacognitive skills can self-regulate, and self-reflect strengths, weaknesses, and the types of strategies learners created as it is considered a critical component of successful learning. (Altindag & Senemoglu, 2013).

### **2.2.4 Self-Regulated Learning (SRL)**

SRL entails metacognitive, strategic, and motivated actions that result in self-directed and academically effective learning forms. During SRL, learners' practices metacognition by examining their own thinking or cognition. Learners examine the task's requirements and make deliberate decisions about how to complete it successfully. SRL entails learning, selecting and implementing good strategies, modifying the task , and monitoring and also evaluating progress under the influence of specific metacognitive, motivational, and environmental factors (Alvi & Gillies, 2020). SRL takes place in cyclical phases in which the learners establish learning goals and realistic plans before learning (SRL - forethought phase), then implement strategies and experiments during learning (SRL - performance phase), and finally engage in self-reflection after learning (SRL - Self-reflection phase). As a result, the self-regulated learner is self-regulated to the extent that they are active participants in their learning process in terms of metacognition, motivation, and behavior (Zimmerman & Schunk, 2001).

### **2.2.5 Commonalities between Experiential Learning and Self-Regulated Learning**

Working on (Alvi & Gillies, 2020) study on how SRL and EL can be mutually benefits. SRL has many similarities with EL in terms of metacognitive, motivational, and strategic aspects of the learning process, as illustrated in Figure 2.1., and it requires learners to put the experience at the center of the

learning process and make informed choices. In this research, we found that SRL and EL has mutually benefits and therefore we used this knowledges as sources to support metacognitive thinking of EL by using SRL concepts.

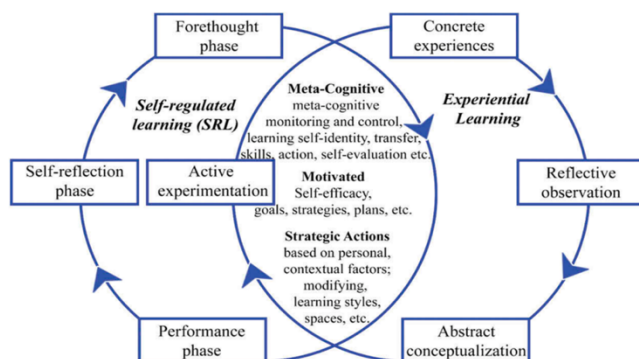


Figure 2.1 Commonalities between self-regulated and experiential learning (Alvi & Gillies, 2020)

## 2.2.6 Goal Settings

Goal Setting is one of aspect in the forethought phase of SRL and EL which allow learners to set learning goals which enhanced commitment to attaining those goals and also promoted self-efficacy (Zimmerman & Schunk, 2011). According to Schunk (1983) and Bloom (2013), by setting realistic and challenging goals increases self-efficacy and motivation to learn. In this research, goal setting is important aspect of AC process in EL. Morisano et al. (2010) also noted how learners with defined objectives tend to be more able to focus attention and effort toward goal-relevant tasks and away from goal-irrelevant ones, suggesting a stronger ability for self-regulation.

## 2.2.7 Attributional Feedback

In educational settings, feedback has traditionally focused on information provided to learners after a task or a test of achievement has been completed (Butler & Winne, 1995). Attributions are significant because in this research because it show that they have varying effects on motivation (Weiner, 1992). There are numerous attributions, such as ability, effort, task ease/difficulty, luck, strategy use, assistance from others, and environmental conditions. None of the attributions has received as much attention as effort. Effort is a popular attribution that is highly valued by parents, teachers, counselors, coaches, and employers (Schunk, 1982; Weiner, 1992).



## **2.2.8 The roles of Mentor**

To support the EL, mentor plays the role to help the learner advance the EL cycle not only arrange for a hands-on concrete experience but also promote reflective observation and abstract conceptualization to strengthen understanding (Tanaka et al., 2017). Brown et al, 2018 suggests that throughout the internship process, serves as the student's "teacher," and the quality of his or her supervision influences the student's experience. A study of Tanaka et al., 2017 proposed learner-mentor interaction model that support learner to follow EL cycle and provide training materials to support learning and provides good practice by using the weekly report that follows EL cycle as an important teaching document for the learner to practice reflection and conceptualization on work experience and gain support from mentors. This study suggests examining the mentor's thoughts on how to support employee learning, especially how to recognize the learning problem on EL and how to motivate the learner to learn EL.

## **2.2.9 Reflective Thinking and Reflective Writing**

A study of Farahian et al., 2020 concludes the characteristics of Reflect Thinking and Reflective writing as: It is defined as a purposeful thought strategy focused on a specific concept or matter. Reflection necessitates a certain amount of time. Reflection fosters cognitive development and guides to new insights that pave the way to forthcoming directions. Reflection is cyclical in nature, which means it can potentially stimulate learners to generate new ideas and conceptions that will direct future learning. In this research we support reflective thinking by reflective writing. As, reflective thinking creates environments for different perspectives to coexist, allowing the learners to lookback their own introspections.

## **2.3 Literature Reviews**

### **2.3.1 Reflective Writing as Reflection**

In the recent survey of related research, the use of writing internship report to document their own learning and to support reflection (Tanaka et al., 2017; Chu et al., 2012; Chanlin & Hung, 2015; Dressler et al., 2018). Dressler et al. (2018) conducted a study that investigated tweet format-style, 140 character, reflective writing to identify and react to multiple experiences and emotions from surgical clerkship and concluded that short form of writing can be a useful structure for reflection. To promote evaluation and retrospection, Chanlin and Hung (2015) urge students to submit thoughts in an online internship diary system. The majority of interns were pleased with the learning and

reflecting procedures incorporated into journal writing. While Chu et al., 2012 recommend blogging as a tool for learning during an internship in collaborative learning, reflection, and social support. Tanaka et al., 2017 using the weekly report that follows EL cycle as the important teaching document for the learner to practice reflection and conceptualization on work experience and gain support from mentors. A study by Toom et al., 2015 and Boud et al., 1985 investigate the problem of reflection on experience and suggest that it needs to be guided.

### **2.3.2 Problems of Experiential Learning in the internship**

Through the extant literature with studies of experiential learning and internship, few works investigate on the problems of EL. Boud (1985) and Toom (2015) investigate the problem of reflection on experience suggest that needs to be guided. We investigate about EL problems such as passive learner on how to change passive learner to active in EL. The problem of both of the learner and mentor do not realize the meaning of EL in their learning growth. Also, the problem of the learner cannot conceptualization well is addressed. In this research, to achieve this goal, we investigated the learners' problems, externalize and conceptualize those problems and difficulties to support on learning how to learn in the long-term internship.

### **2.3.3 Experiential Learning support in the internship**

There are works investigate about support the learners in the internship, such as Dressler (2018), ChanLin (2015), Chu (2012) by using IT tools such as online journal, blog and website form by let the learners document their own learning and to support reflection. Based on the problems of EL are discussed, not only by IT system to record their own learning but also the need to support of how to learn to reflection and conceptualization on their experience to maximize their employability and life-long learning. To achieve this goal, this work define and develop the learning support functions by providing a framework based on EL. The web-based system which the learners use to acquire EL concepts by reflective writing guided by EL formatted questions. We can observe that the learner improves the progress on EL from reflective writing data. However, the conceptualization is not well represented in reflective writing. This observation implies that the conceptualization is done implicitly but cannot externalize it. As reflective writing is evidence of reflective thinking (Martin Hampton), and reflection is a process that can describe as thinking about one's thinking and behavior (Schon, 1996; West, 1996). In this research, we design the sentence openers function, which allows learners to use deep thinking to complete the sentence using the sentence openers through reflective

writing to promote learners' acquisition of deeper EL concepts. The sentence openers also have a role in suppressing shallow thinking to avoid ineffective reflection. The focus point of learning in EL is direct personal experience, which also serves as a tangible common reference point for assessing the new implications of information obtained during the learning process. Figure 1 depicts Kolb's concept of learning as a process of conflict resolution between two dialectically opposed dimensions: the prehension dimension of apprehension and comprehension and the transformation dimension of intention and expansion. In EL, experience is the focal point of learning, as well as a concrete common reference point for assessing the new implications of information gained during the learning process. Most of the learners do not seem aware that the experience is the focal point, which can be viewed as the input or the output of each stage of EL. We designed the user interface for the learners to support the awareness of input and output to promote the transition between EL stage to complete the EL cycle and pass through all dimensions.

#### **2.3.4 Mentor role in support of Experiential Learning in the internship**

According to Brown (2018), the mentor acts as the student's "teacher" throughout the internship process, and the quality of his or her supervision has an impact on the student's experience. However, Brown (2018) does not state on how to support the learner. Tanaka (2017) proposed learner-mentor interaction model that support learner to follow EL cycle and provide training materials to support learning. This work provides the good practice by using the weekly report that follow EL cycle as the important teaching document for the learner to practice reflection and conceptualization on work experience and gain support from mentors. Tanaka (2017) suggests examining the mentor's thoughts on how to support employee learning especially how to recognize the learning problem on EL. To archive this goal, we investigated in the large group of learners. Design and develop the model for mentor to support the learner to recognize the learning problem.

As Redshaw (2001) states in his work "mentoring and coaching help employee grow." With the fact that to support the learners' learning is the difficult task. In addition, to support the hundreds of students in the external workplace for the mentor to mentoring is impossible to support a large number of students. Mentoring on the learning is intellectual tasks as it is difficult to make a comment and asses based on the interpretation of the learner's status include strengths, knowledge, abilities and willingness to learn (Shimada, 1994; Tanaka, 2017). Tanaka (2017) suggests that it is important to examine on how the mentor support the learner. Thus, it is important to define and develop support functions to the mentor to ensure the growth of learners. In this work, we developed

the framework based on EL to support mentors by provide support functions such as easy to describe and easy to select the comments to give feedback to the learner about their learning and provide good guidance to learn how to support the learner on EL

### **2.3.5 IT Tools to support the internship**

There are works investigate about supporting the learners in the internship such Chu et al., 2012; Chanlin & Hung, 2015; Dressler et al., 2018 by using IT tools such as the online journal, blog and website form by let the learners document their own learning and to support reflection. Based on the problems of EL we discussed, not only by IT system to record their own learning but also the need to support of how to learn to reflection and conceptualization on their experience to maximize their employability and life-long learning.

# Chapter 3

## Pilot Study

### 3.1 Introduction

The primary purpose of this chapter is to present the methodology of this research. First, the internship program background is explained, and the pilot study results are present in this chapter. Later, we extend what we learned in pilot study in distance learning setup.

The internship is a crucial learning process that provides a unique experience to combine what they learned in university courses and how to use it in real society during their university lives. It provides the opportunity to learn through work experience offered by the external organization. Although learners can learn career skills through the internship, many learners cannot make good reflection and cannot learn how to learn from experience. We think of this problem because most learners cannot reflect on their experience and cannot clear the abstract concept and apply it to the next trial. This problem implies that those learners can improve their learning through internship by acquiring experiential learning skills. In the internship, in general, the mentor has the critical education roles. One is to foster career skills learning, and the other is to promote experiential learning. However, in most case, the mentor is very good at career skill teaching, but most of the mentor is not well prepared to support experiential learning. In response to the above problems, to support learners to realized good learning, we provide a learning environment for the learner to support experiential learning. A guideline for the learner to let them aware of the critical concept of internship and experiential learning. Also, we provide a web system to practice reflective writing to understand and apply experiential learning concepts. In the chapter, as the preliminary research to develop learning environment, the analysis of the learner learning activity of the current internship program and show the prototype of the conceptualization of the educational concepts to support the experiential learning. The main finding is that the learner develops EL skills well but cannot verbalize it through reflective writing.

### 3.2 Background of the multi-phase internship program

In this study, we select a Thai private university named Panyapiwat Institute of Management (PIM) that has a unique internship program. The uniqueness includes a long internship period of three

months to nine months long, with multi-phase training. The learner participates in the extensive internship program, as shown in table 3.1.

Table 3.1 The curriculum of the internship program of Panyapiwat Institute of Management (PIM)

Phase	Study Year	Semester			
		<i>1.1</i> <i>Aug-Nov</i>	<i>1.2</i> <i>Nov-Feb</i>	<i>2.1</i> <i>Feb-May</i>	<i>2.2</i> <i>May-Aug</i>
I	1 <sup>st</sup>	Study	Study	<b>Internship</b>	Study
II	2 <sup>nd</sup>	Study	<b>Internship</b>		Study
III	3 <sup>rd</sup>	Study	Study	Study	<b>Internship</b>
	4 <sup>th</sup>	<b>Internship</b>			Job Placement

As the curriculum is integrated with the long period of the internship, they are involved with multiple stakeholders such as mentors, companies, and faculties. In a different phase of the internship, the learner may experience various learning activities with different mentors to support learning, various companies with different working environments.

### 3.3 Research Design and Approach

In this research, the main goal is to develop a learning model to improve the EL process in a multi-phase internship. Therefore, this work organizes into two main phases, as in figure 3.1. The first phase of research is based on the EL problem findings and develop a prototype system to support EL. The findings in the first phase have confirmed the problem of the verbalization of the EL concepts. The second phase has the main goal to overcome the problems found in phase one—the design of learning support functions, the development of a web-based system that includes the Sentence Openers functions for verbalization support. Connecting with the past planned experience to support the recursive learning behavior, and the learning sensors to capture the intended learning behavior in the 10-weeks distance learning setting. The research in Phase 2 is discussed from chapter 4.



Figure 3.1 The research design and approach

Next, the pilot study is explained. The main goal in this study is to understand the current learning situation of EL in the multi-phases internship.

### 3.4 The Pilot Study

The goal in this phase of the study is to understand the current situation of the internship program. Then, we develop a learning model and a prototype of the EL support system. By investigation on the learners' problems in learning how to learn from experience. Then, design learning goals and develop EL support functions for learners.

#### 3.4.1 Open-Ended Questionnaire

We investigate the learners (n=30) on their final year of the internship program that they have already experienced two phases of the internship. The learners were instructed to write the work record book called “Greenbook” as in figure 3.2 and follow a comment by the mentor monthly. The learners need to write down about work they have done during the past month, work characteristics, problems and obstacles, and conclusion. Every three months, the university’s academic advisor visits the learner and mentor in a company to discuss the learner’s progress and then give comments and feedback on their learning activities.

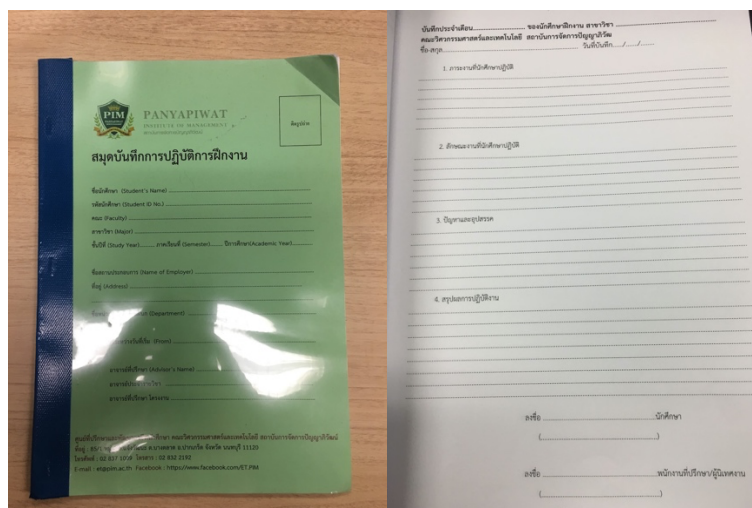


Figure 3.2 The work record book or “Greenbook”

We are using the open-ended questionnaire (as Appendix A) to survey the current situation on how well the learners aware of EL concepts. Based on the survey results, we found that some learners are aware of EL’s concept very well as they can apply the experiential concept in the internship. In comparison, another

group of learners cannot be aware of EL well and do not know how to apply them in practice. We can characterize the learners using the learning readiness of EL. Learning readiness of experiential learning is a degree of EL learners' knowledge that prepares them for involvement in activities in EL contexts.

Table 3.2 The descriptions of the characteristics of the learners based on EL readiness

<b>Learner</b>	<b>Description</b>
4 (High)	<p>This learner is somehow aware that the internship is for their learning, but this learner still focuses on learning how to work by making learning concepts using concrete words. The learner, aware of the concept of SRL and reflection well can see that the learner describes, “record four months already so I know what my mistake which part is still not good is. I can see my disadvantage point, and I can improve myself afterward.”. This learner’s attitude is good as the learner feels it is hard but can adapt to the internship. The learner feels that the internship’s meaning is to gain experience but still does not realize that the greenbook is for reflection. The mentor gives a face-to-face comment to point out what and where to improve when the academic visit the company; the academic advisor never writes any comment or feedback on the greenbook. The learner suggests bringing the greenbook back to read about their experience so the learner can practice what is missing.</p>
5 (Middle)	<p>This learner is somehow aware that the internship is for their learning but still cannot see the value of internship as the learner states that doing a work record is just for the grade not to be F. This learner is well aware of the SRL concept as the learner uses the green book to help as a memo to know what the learner has done and what kind of work, what is the advantage and disadvantage to improve the learner. However, the learner is poorly aware of the reflection concept and does not use the greenbook for reflection. Also, not aware of the value of EL well. For the reflection on action, the learner has a good attitude toward the reflection on action. The academic advisor uses face-to-face communication when visiting the company but does not write it down on the greenbook. The learner wants to re-read the submitted greenbook to see what needs to improve to practice some skills to be ready for the next internship.</p>



10 (Low)	This learner has a bad attitude toward the internship and feels unhappy about the internship as the learner describes this internship as stressful. Also, the mentor's relationship is not good because the learner describes that cannot catch up with the mentor. The learner uses the greenbook to record work to see what has been done but feels not convenient. The learner state that an internship is for knowledge gain. For reflection-on-action, the learner feels that mentor gives good advice. For the academic advisor, the learner feels just ok about the comment in the greenbook. The learner wants to re-read the submitted greenbook to ready for the next internship.
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From the results, we characterize the learner into three, which are high readiness learner, middle readiness learner, and low readiness learner. High readiness learners are aware of EL well and actively apply EL to their internship. Middle-readiness learners are somehow aware of EL's concepts, but they cannot apply them consciously. Low readiness learners do not become aware of the important concepts of EL and have a bad attitude toward internship.

We summarize the problems found here. First, give EL the concept as there is no good way to give EL's concept. Second, how to apply EL concepts and how to keep EL activity active are investigated. At this stage, learning goals are designed to deal with the problems and to set targets to improve learners' experiential learning.

### 3.4.2 Design of the learning goals

The goal of this research is to improve the target learner's experiential learning skills. This section discusses our design of the learning goals to support them based on the proposed experiential learning. The learning hierarchy is "a set of specified intellectual capabilities having, according to theoretical considerations, an ordered relationship to each other" (Gagne, 1968). The conceptualization of hierarchical learning goals design based on experiential learning are developed as in figure 3.3

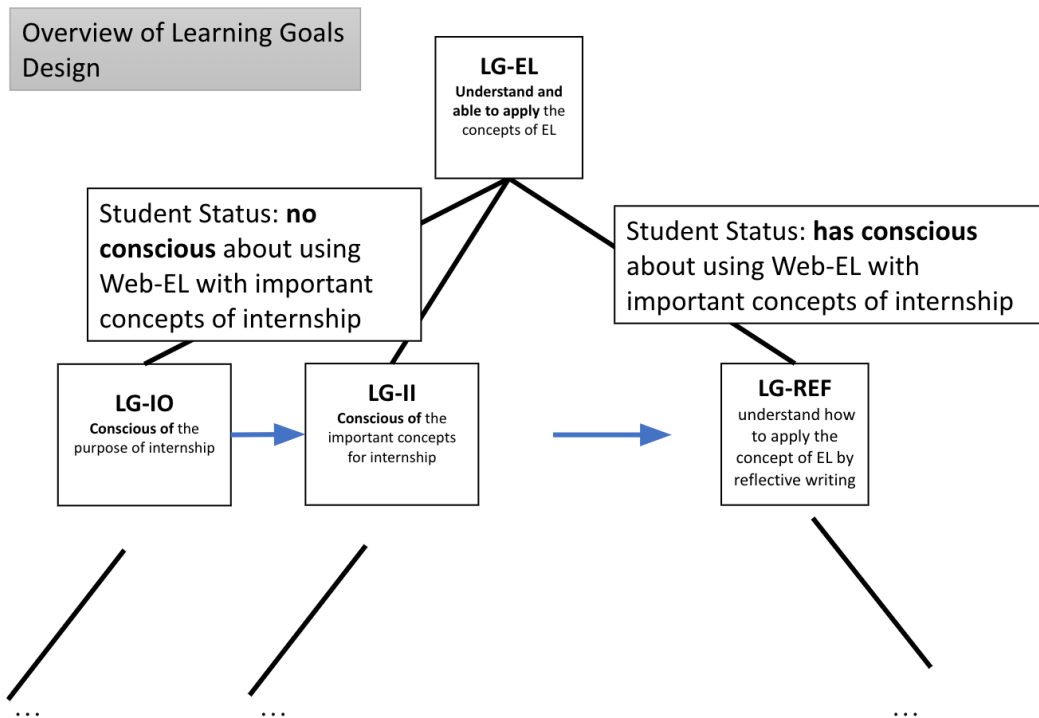


Figure 3.3 The learning goals

The top learning goal is for learners to understand and apply the concepts of experiential learning (LG-EL). By acquiring the knowledge about the purpose of internship in internship orientation (LG-IO) and then the guideline that explains the important concepts of experiential learning in the internship (LG-II) as well as a web-based system as the application to let the learners apply the experiential learning concepts by reflective writing (LG-REF).

### 3.4.3 Design of the guideline for learner

We developed the guideline to provide learners prior knowledge about important internship concepts and which the goals can be divided into four sub-goals as in figure 3.4.1 and 3.4.2.

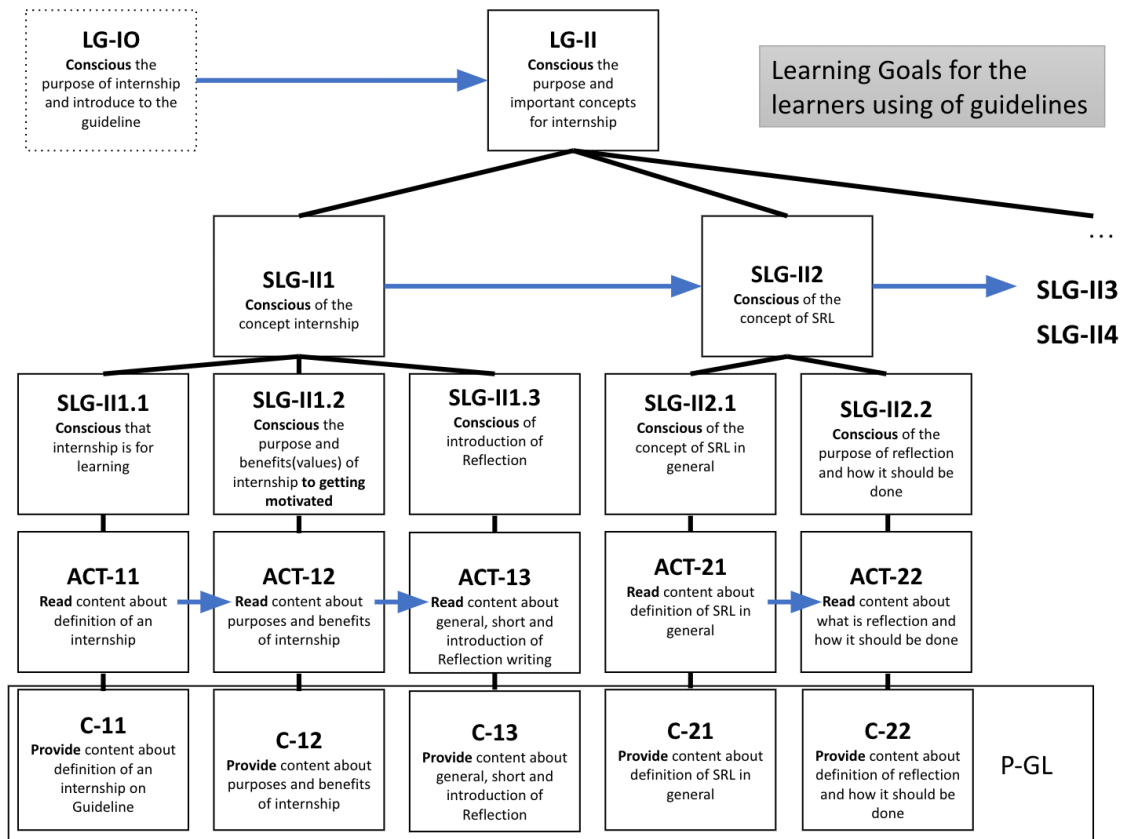


Figure 3.4.1 The learning goals for the guideline for learners

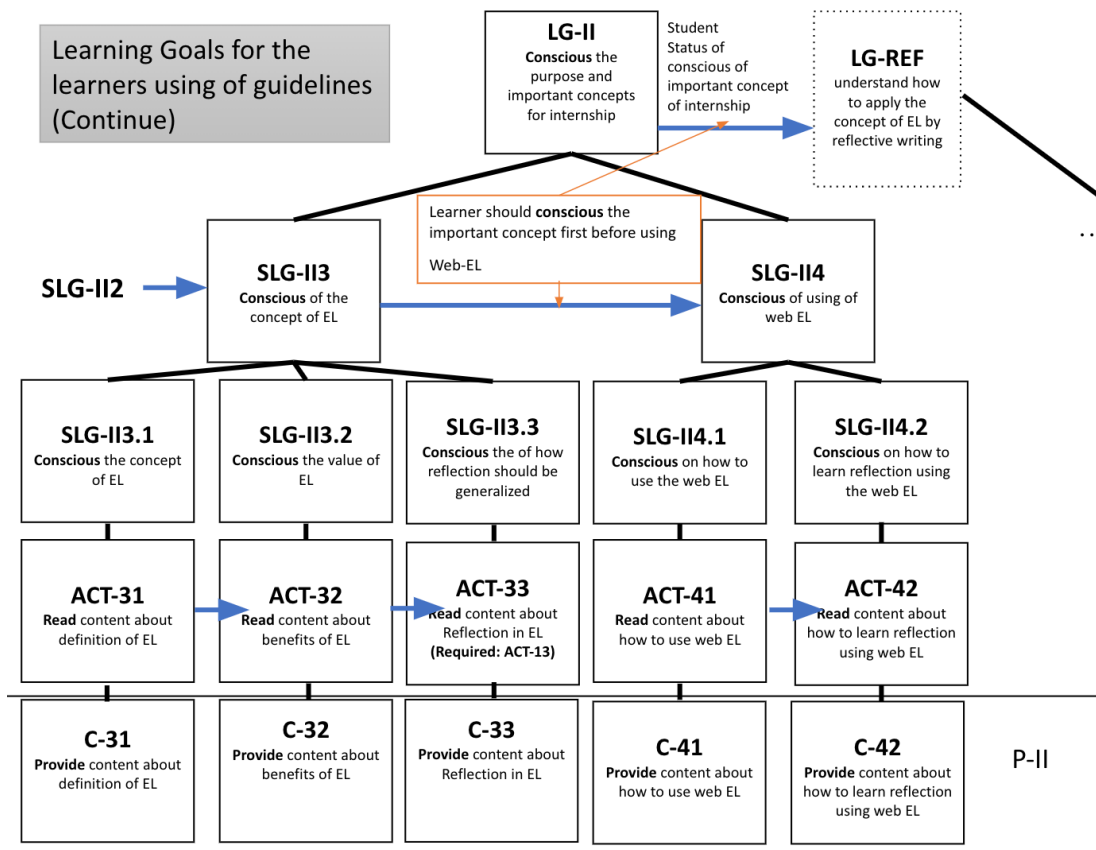


Figure 3.4.2 The learning goals for the guideline for learners (continue from 3.4.1)

First, conscious of the internship concept (SLG-II1) by providing the content about the purposes and benefits of an internship, the internship is a chance to learn and introduce how reflection should be done. Second, conscious of Self-Regulated Learning (SLG-II2) concept by providing the introductory concept of Self-Regulated Learning and the purpose of reflection as Self-Regulated Learning. Third, conscious of experiential learning (SLG-II3) by providing the content about the concept of experiential learning, Kolb’s learning cycle, and the value of experiential learning. Lastly, conscious of using the web-based system (SLG-II4) to apply the experiential learning concepts by reflective writing by providing the instruction on how to use the web-based system to write weekly reflective writing to gain a deeper understanding of EL concepts.

# คู่มือการฝึกงาน สำหรับนักศึกษา Internship Guidelines

เนื้อหาของคู่มือการฝึกงาน Contents

1. เกี่ยวกับฝึกงาน (About Internship)
2. ศึกษาคือ Self-Regulated Learning (SRL) (What is Self-Regulated Learning (SRL))
3. ศึกษาคือ Experiential Learning (EL) (What is Experiential Learning (EL))
4. การใช้ระบบ EL ผ่านเว็บไซต์ (How to use Web-EL)

## 3.1 Experiential Learning Definition [C31, C32]

Experiential learning is a way to provide you with hands-on exposure to careers in the workforce. These activities provide you with a conceptual understanding of real-world problems, situations, and experiences.

Below is a diagram of how one contemporary experiential learning theorist, David Kolb, explains how interns learn from experience. Kolb's experiential learning style theory is typically represented by a four-stage learning cycle in which you 'touches all the bases'.



Figure 3.5 The example of contents in the Guideline for learners

The guideline is provided via hard copy and online, so the learners can study by themselves to gain prior knowledge and motivation to learn EL, as shown in figure 3.4.

### 3.4.4 Prototype of the EL environment

After the learners become conscious of the crucial experiential learning concepts and know how to use the web-based EL system to practice their reflective writing about their internship experience by verbalizing, the web-based EL system has goals as figure 3.6.

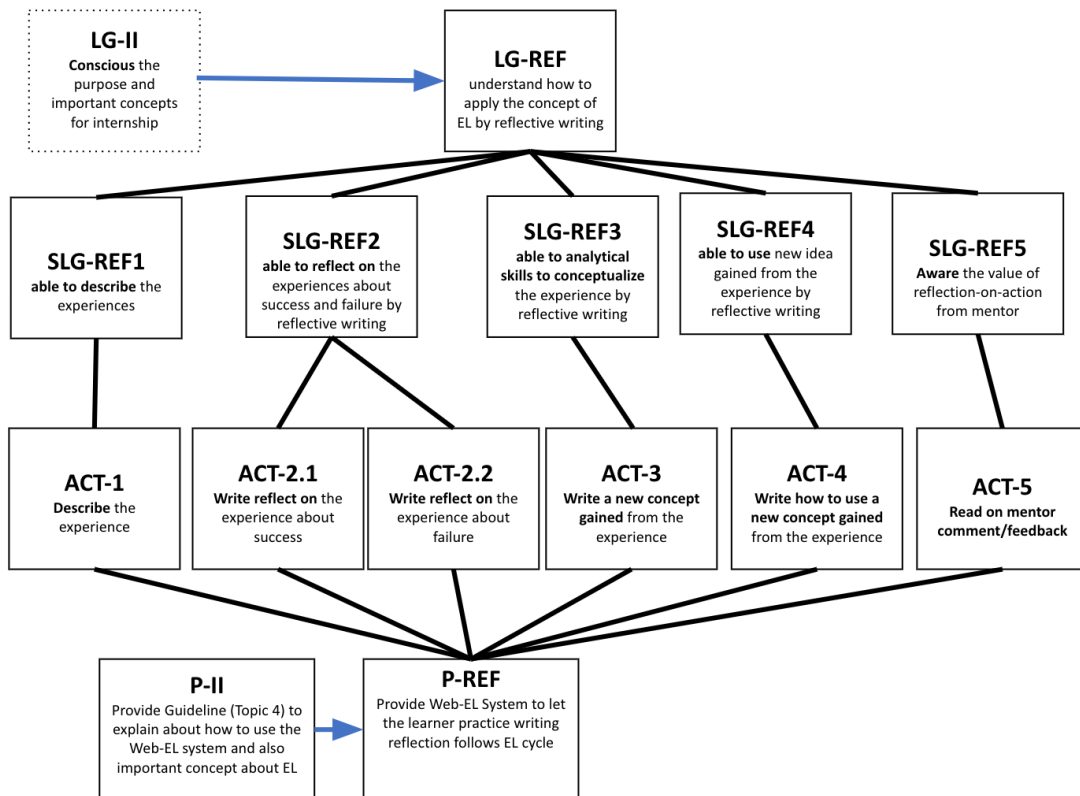


Figure 3.6 The learning goals for the web-based EL system.

We develop the web-based EL system in which learners practice experiential learning skills by reflective writing on a weekly report to understand how to apply the concept of experiential learning by reflective writing (LG-REF). Each week, they need to reflect on their experience based on the formatted questions related to Kolb's experiential learning cycle as figure 3.7. For each weekly report, it can be shared with the other learners online.

Figure 3.7 The prototype of web based EL system let the learners practice reflective writing as a weekly report of learner A

First, they describe what they have experienced during a week (Concrete Experience-CE) for this activity corresponds to a goal to able to describe the experience (SLG-REF1). Second, reflect on both success and failure experience (Reflective Observation-RO) as they may only see the failure. However, both successful and failure experiences are good for experiential learning as well, for this activity corresponds to a goal to able to reflect on the experiences about success and failure by reflective writing (SLG-REF2). Third, thinking about what they have learned from the experience (Abstract Conceptualization-AC), this activity corresponds to a goal to use the analytical skills to conceptualize the experience by reflective writing (SLG-REF3). Lastly, thinking on how to apply what they learned to the next chance (Active Experiment-AE) this activity corresponds to using the new idea gained from experience by reflective writing (SLG-REF4).

After the learners complete their reflective writing, the mentor will advise the learner to improve their learning that triggers the mentor’s comments. This activity corresponds to a goal to be aware of the value of reflection-on-action from a mentor (SLG-REF5). The learner can check the concepts of experiential learning on the guideline to not lose the direction. We plan to develop a verbalization support system that helps the learner choose sentence starter to describe their learning. In this prototype system, the learners’ reflective writing data will be used for analysis to find good sentences as examples to use in the verbalization support system.

### 3.4.5 Research Methodology

We collect the data from six learners that participate in the 12-weeks internship program in the company in Kitakyushu city, Japan. The learners use the prototype system for their weekly report writing based on EL-format. We observe from the weekly report of five learners and choose one learner as the best case to discuss as he made the best progress but still have problems in learning SRL skills since the analysis is on the progress and this experiment shows the prototype to demonstrate the important components.

We can observe that the learner improvement progress on his learning from his reflective writing data. Before this learning activity, he knows about experiential learning concepts implicitly and has no consciousness and awareness of self-regulated learning. After applying this learning activity, we can observe using the web-EL system that he progresses on applying SRL to his internship activity step by step. He reflects on his learning using SRL skills, which show in a weekly report, but the conceptualization is not well represented in reflective writing. We want to know how he made progress in developing self-regulated learning and why he cannot make explicit conceptualization in his reflective writing. The sample reflective writing, as shown in Table 3.3

Table 3.3 The sample of reflective writing of the learner

<b>What have you experienced? (CE)</b>
I present my work to the customer.
<b>Succeeded Experiences (RO)</b>
I can build electrical control box on by myself.
<b>Failure Experiences (RO)</b>
I cannot use mechanic tools well.
<b>What you learned from the experiences? (AC)</b>
When using mechanic tools, I should use it carefully
<b>How you will make use of learning for next? (AE)</b>
I will ask my mentor if I don’t know how to use mechanic tools.

The qualitative analysis of the system functions on education to investigate how the system helps the learners to learn and how the learning feels on his learning achievement supported by the system. Through a semi-structured interview of fourteen basic questions and six additional questions (Appendix B), the learner told us that the system functions help him do reflective writing and promote him to carefully think about EL that he has learned in the guideline.

Interestingly he told us that he observes other learner's writing and applies the knowledge to his work. This implies that he may conceptualize to transfer the knowledge that he abstracted from the other learner's weekly report to his tasks. When asking about the learning achievement, he said that he could change his behavior to be more self-regulated than before to better plan his task.

As a result, he can do conceptualization implicitly but cannot externalize it. The importance of verbalization is the way to promote the collaborative development of knowledge through SRL. As discussed in the above section, we can confirm our plan to develop verbalization support for verbalizing support using the list of sentence starters to help the learner learn the sentence structure, keywords and promote deep thinking by deep writing.

### **3.5 Concluding Remarks and Findings on the problem of Verbalization**

In this pilot study, we develop a learning environment to support experiential learning, analyze the learner learning activity of the current internship program and show the prototype of the conceptualization of the educational concepts to support the experiential learning. As the preliminary research, a developed prototype of the conceptualization of the learning concepts can support the learners in experiential learning. However, verbalization is not well represented, as also mentioned with the hypothesis. The quality of the weekly report is low as the learner cannot write it more in-depth. Their week reflection report's analysis shows that they cannot connect the past experience to the present. Moreover, the learner cannot connect each EL concept and does not realize the input and output of each process of EL; they cannot integrate EL concepts.

From the findings, we do further development by providing verbalization support by using the sentence starters to help the learner verbalize the conceptualization.

Also, we plan to develop a guideline for a mentor to support mentoring in experiential learning during the internship program. We discuss in a later chapter the next development of the verbalization support.



# Chapter 4

## An Experiential Learning Framework

This chapter explained how the learning goals to support Experiential Learning in Distance Learning are developed. Based on the EL problems about the verbalization that we discussed in chapter 3. In this chapter, the learning goals designed are presents. After the learning goals are designed, we developed the learning support functions based on the learning goals—the learning design with the instruction for the learner to learn and develop EL skills. The mentor support function is also design in this step. Before discussing the details of support functions in the learning environment, we outline the three main phases of the EL framework, details in each phase is discussed in section 4.3 onward (see Fig. 4.1):

- Pre-phase: understand EL concepts
- Experiencing phase: understand how to apply those EL concepts in reflective writing
- Post-phase: reflect on the self-monitoring of metacognitive thinking

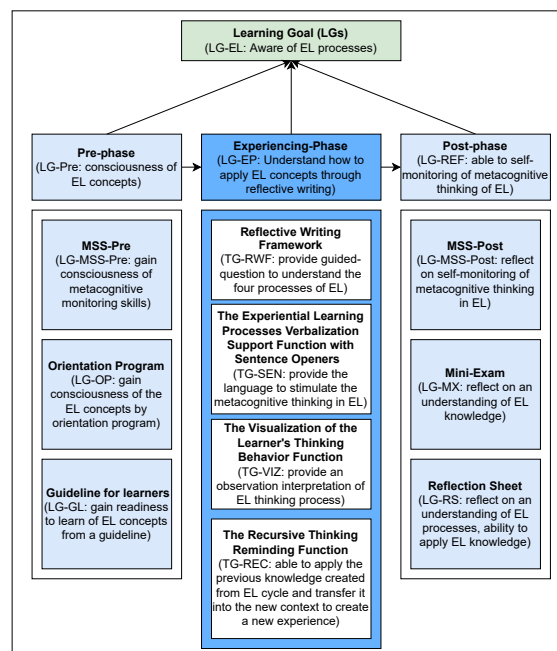


Figure 4.1 The experiential learning framework

### 4.1 The problems and difficulties of EL

Based on the findings on the EL problems and difficulties in chapter 3, in this section we present those learning problems and difficulties that lead to the design of the learning model consider the report on figure 4.2.

(CE) What have you experience?

What have you experience?\*  
 I write Java Programming

(RO) What are your success and failed experience?

What are your success and failed experience?\*  
 It works!

(AC) What have you learned from the experience?

What have you learned from the experience?\*  
 I learned that life is not easy.

(AE) What will you make use of learning for next?

What will you make use of learning for next?\*  
 I will

CLEAR
SAVE
SUBMIT

Figure 4.2 The learner reflective writing report

### 4.1.1 Learner can do conceptualization implicitly but cannot externalize/verbalize it.

As the findings discussed in chapter 3, the learner learned EL and gain SRL implicitly but cannot externalize it. It is observed by the quality of the report writing that the learner uses shallow thinking and represents as shallow writing. Therefore, the need for verbalization support is essential to promote verbalization and deep thinking.

### 4.1.2 Do not use the past experience into the new experience

#### (Recursive)

The learner does not use the past planned experience written in AE part in the week before into the current week report writing. As Kolb and Kolb, 2015 state that “All learning is relearning. Learning is best facilitated by a process that draws out the students’ beliefs and ideas about a topic so that they can be examined, tested, and integrated with new, more refined ideas”.

### 4.1.3 Cannot integrate EL concepts

The learner views EL concepts as separate from each other. For example, the learner may not recognize that the CE output can be the input in the RO phase. How can we teach the learner to recognize the input and output role in each EL process is on consideration.

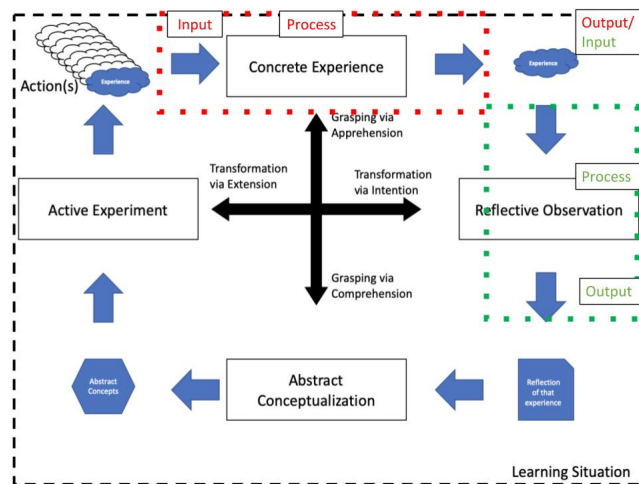


Figure 4.3 the integration concepts of EL

### 4.2 Development of the learning goals

The goal of this research is to improve distance learning by promoting experiential learning skills. The goal of learning in this learning environment is that the learner acquires the skill but still has not mastered it to the point where it comes autonomously. Based on Curtiss and Warren, 1973 explained the learning stages as in figure 4.4:

1. **Unconscious Incompetence:** The learner does not have a skill or knowledge set yet. The learner sees no reason to learn because they cannot recognize the importance of it.
2. **Conscious Incompetence:** The learner is aware of the skill and awareness of their lack of knowledge. It involved “Trial and Error” to learn the skill.
3. **Conscious Competence:** The learner acquired skill but still has not mastered it to the point where it comes naturally. The learner needs trial and error and uses tools through the steps.
4. **Autonomous:** The learner acquired skill with consistent achievement of desired results that the learner has mastered all subparts of skill and can combine them to perform the whole sequence automatically with precision and are performed unconsciously. The skills can be used and apply in a variety of situations.

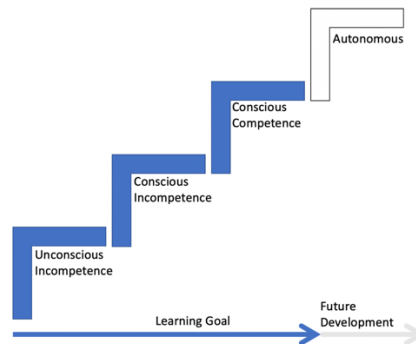


Figure 4.4 The Stages of Learning (Curtiss and Warren, 1973)

From the stages of learning and the problems and difficulties of EL, the learning goals development and learning design to teach the learner EL concepts are structured as follows in figure 4.1. The learning starts from the beginning, which is the realization of the crucial concepts phase. The main learning goal in this phase is to realize the important concepts to learn in EL. This has the aim to give knowledge of important concepts to the learners to realize the concepts of EL as well as the method to teach EL during the distance learning period. The benefits and value of EL learning in DL give the learner more motivation to learn. Follow by the awareness phase, in this phase; the learners can apply what they learned in the class to the actual distance learning experience. The main goal in the awareness phase is to understand how to apply EL concepts through reflective writing. Lastly, the main goal is to understand and apply the concepts of EL even after this period. The learner can apply in a more advanced situation, such as in the internship program.

### 4.3 Pre-phase

In the pre-phase, we prepare related knowledge for learners to promote the readiness of EL. Learners understand what they will learn and use it in the experiencing phase. In this way, learners will be motivated to think of their goals and learn about EL concepts. Thus, the main goal of this phase is to promote the understanding of EL concepts. The following educational programs can accomplish the goal in different ways.

#### 4.3.1 An orientation and guideline for the learners

Before learning begins in the learning environment, learners must gain an understanding of EL concepts through an orientation program. This orientation program teaches learners about the thinking skills required to be active global citizens in the 21st century (Pamungkas, 2020) to enhance their motivation to learn these skills. The program content is designed to promote understanding the importance of promoting reflective thinking skills to

understand the need for EL concepts as well as the EL concepts themselves. This shows how to perform reflective writing in the learning environment and explains the benefits of promoting metacognitive thinking. Moreover, the content of the orientation program is included in the guidelines for learners to prepare them to learn EL concepts, as EL can develop skills better if learners have prior knowledge of the task. When learners start their reflective writing in the learning environment, upon their reflection, they recall the lecture content and realize the importance of knowledge by connecting with experience.

### **4.3.2 The metacognitive skills scale -before (MSS-PRE)**

We use the 30-question MSS, which was originally designed to assess university students' metacognitive skills (Altindag 2013). However, we employ it as an educational tool to promote EL reflection at the meta-level. By learners answering these 30 questions, we expect them to reflect on their metacognitive skills, know how to self-monitor, and establish a goal to develop those EL skills.

Table 4.1 shows an example of how learners may reflect on MSS-PRE. As shown in the first column, learners start to reflect on their metacognitive skills in question Q.03, "I use my previous experience while organizing my learning." They then start to self-monitor their metacognitive skills, as shown in the second column, "I think I have done this before in my previous course. I think I can do it well." MSS-PRE aims to improve learners' understanding of self-monitoring during metacognitive thinking.

## **4.4 Experiencing Phase**

Because practice is essential for developing metacognitive skills (Kolb,2019), this phase aims for learners to understand how to apply EL concepts in their reflective writing. Learners practice reflective thinking through the EL environment. In such an environment, they practice EL skills by connecting their real-world experience with EL concepts and obtaining support from mentors.

The reflective writing framework, the main learning support method in this research, provides the opportunity for learners to think by practicing reflective writing based on EL-guided questions. Under this framework, learners explicitly recognize the relationships among the four stages of the EL process (CE, RO, AC, and AE) through their reflective writing and can follow those stages to reflect on their experience. The reflective writing framework also comprises support functions to ensure learners learn EL concepts with adequate support. The following functions can accomplish this goal in different ways.

### **4.4.1 Verbalization Support with the sentence openers**

This function provides sentence opener candidates as language to reflect which show the degree to which each sentence is similar based on EL concepts. The various sentence openers allow learners to explore the connection with their experience by reflecting, self-questioning, reminding, making choices, and evaluating sentence opener candidates, which provides learners with the opportunity

to think deeper. All these sentence openers help suppress poor reflective writing through writing support. Therefore, this function provides sentence openers as the language to reflect and stimulate metacognitive thinking in EL through verbalization.

#### **4.4.2 Visualization of learners' thinking behavior**

This function is designed to indirectly support learners by showing how the learners use sentence openers and visualizing it as a heatmap for mentors to show thinking tendencies. Mentors can interpret how learners are changing their thinking style from such a visualization of writing style change. Learners are supported through feedback from mentors.

#### **4.4.3 Recursive Thinking Reminder**

To make learners recognize the importance of the recursive nature of experience to make a linkage between EL cycles. This function aims to remind learners to apply the previous knowledge created from EL cycle and transfer it into new contexts to create a new experience.

### **4.5 Post-Phase**

This phase allows learners to reflect on their thinking in EL and metacognitive thinking skills.

#### **4.5.1 MSS-POST**

While MSS-PRE prepares learners' to learn metacognitive monitoring in EL and understand how to reflect on experiences abstractly, MSS-POST is used as an instrument for learners to reflect on their own monitoring of metacognitive thinking in EL. Table I shows an example. Learners learn EL concepts by practicing monitoring and controlling their learning activity through reflective writing in the learning environment. They then reflect on their ability to apply the metacognitive skills in EL as well as improve their EL skills. One example is question Q.33, "It is important for me to build meaningful relations between the learned subjects during learning." In MSS-PRE, learners may not recognize the meaning of this skill, as shown by the example of how they think, "I am not sure about the meaning behind this item. I think I have never done this before. I will try to apply this skill in the future." For MSS-POST, learners may reflect on the self-monitoring of metacognitive thinking in EL, that is, "I understand the meaning of this item now and I have the experience to apply EL skills to build a meaningful relationship between what I have learned and what I have experienced. I think I can do this well."

Table 4.1 Example of how learners might think from MSS-PRE and MSS-POST

Example question in the MSS	Learners' reflection (MSS-PRE)	Learners' reflection (MSS-POST)
I use my previous experience while organizing my new learning [42, Q.03]	I think I have done this before on my previous course. I think I can do it well.	When I experienced learning through the learning environment, I realized that I had not done this much and could not do it well. I should learn to reflect on my experience to improve my EL skills.
It is important for me to build meaningful relations between the learned subjects during learning [42, Q.33]	I am not sure about the meaning behind this item. I think I have never done this before. I will try to apply this skill in the future.	I understand the meaning of this item now and I have the experience to apply EL skills to build a meaningful relationship between what I have learned and what I have experienced. I think I can do this well.
I critically make a plan before beginning to study a text [42, Q.36]	I sometimes plan before studying a text; I think I should plan more often to improve my learning.	I always plan before studying a text after I learned EL through this learning environment.

### 4.5.2 Mini-exam

This mini-exam, which aims to test learners' understanding of EL, is introduced in an orientation program as a motivational tool to encourage learners to learn EL concepts. After the experiencing phase, learners are asked to answer the following question: "How would you define EL in your words?"

### 4.5.3 Reflection sheet

The reflection sheet consists of a five-point Likert scale to reflect learners' understanding of EL concepts (CE, RO, AC, AE, and recursive thinking) and open-ended questions to reflect their attitude, behavior, understanding, and change in learning ability in this environment.

To achieve the learning goals in EL framework, the learning support functions' user interface design to support the learner to reach learning goals is designed we discuss in chapter 5.

## Chapter 5

# An Experiential Learning Environment Design

In this chapter, the design of EL environment is discussed. In chapter 4, we discussed the educational goals of our EL framework. To obtain those goals, in this section, we explain how we designed each support function to provide learners with the experience of practicing EL through reflective writing.

Research on learning environments typically aims to design learning objects representing real-world concepts (conceptual fidelity) and show the meaning of those concepts through simulation (Bland, 2014). However, in meta-level thinking training or EL thinking, no concrete object is shared with the learner, as only four text fields represent EL processes. In this learning environment, how to guide learners and make them recognize the linkages among the four EL processes and recursive processes between each EL cycle remains unclear. To clarify this point, we introduce sentence openers, which represent the connections among EL processes, and we expect learners to connect their experience with EL concepts to understand the meaning and motivate them to consider how they should think in each EL process.

Here, we introduce the proposed learning environment design, which aims to support reflective thinking by providing writing support based on EL. Specifically, achieving the desired goal, as discussed in the previous section, demands that two objectives be achieved: (i) provide a language for reflective writing to promote reflective thinking based on EL concepts and (ii) provide an observation-based interpretation of learners' thinking behavior.

As most learners have difficulty understanding the four processes of EL, our online reflective writing framework uses the idea of EL-guided questions (Tanaka et al., 2017 & Kingkaew et al., 2019) to enhance their understanding by following the list of EL questions list. For this, we use text fields, each of which is represented by a question, as shown in Fig. 5.1:

- For the **CE** part, the question of “what have you experienced?” guides learners to search for their experience.
- For the **RO** part, the question of “what are your successful and failed experiences” allows learners to reflect on *all* their experiences, as many only focus on successful experiences and do not realize how poor their EL is.
- For the **AC** part, the question of “what have you learned from the experience” guides learners to think of the abstract concept that represents what they have learned.
- For the **AE** part, the question of “what will you use for learning next” guides learners to consider how to apply what they have learned in the future.

In addition, on our design of the user interface, the output of one process is the input into the following process. This should allow learners to recognize the connection between EL processes and this user interface.



Fig. 5.1 shows an example of the CE part: “*I have significant experience of ... tried to develop a program based on object-oriented concepts of inheritance and understand this concept.*” This can be considered to be an output of CE, which then feeds into the RO part as an input (see the dotted line in Fig. 3). In the RO part, “*I succeeded at ... able to understand the concept and write a program using the inheritance concept because... I carefully review my lesson and take time to conduct trial and error to write down the program.*”

## 5.1 The learner user interface

On a weekly basis, the learner completes the weekly reflection through a web-based experiential learning (WebEL) system that we designed. The user interfaces for learners consist of four main parts, as represented in figure 5.1:

**#1 - The recursiveness of experience** has the function to show the list of plans from the past weeks to provide recursiveness of experience concepts where the learner uses the past experience and extend that experience into the new experience. The explanation in detail in section 4.3.

**#2 - The sentence opener** is the function to provides a list of sentences that promote the transition and integration between phases of EL with sub-categories and sentences to apply for reflective writing using nested list format, which is the support of verbalization and deep thinking of concepts. The explanation in detail in section 4.4.

**#3 - Reflective writing based on EL** has the function for learners to reflect (verbalizing and use their deep thinking) distance their experience based on EL format questions with input and output to each phase.

**#4 - The comment and feedback from the teacher/mentor** for displaying teacher comments and feedback. The explanation in detail in later section.

**#5 – Secondary Support Functions** include Feed, Knowledge and Guideline and Reflective Writing portfolio, Hint.

⏪ Week # 4 ⏩

**Reflective Writing Framework**

**(Recursive thinking reminder function)**  
Does your experience connected to the past week ?

click for more information  
Week # 3: I have a plan to check my lesson because I cannot do coding.

click for more information  
Based on your past experience about:  
I have a plan to check my lesson because I cannot do coding.

**(CE)** What have you experienced ? ✖ Delete

*I have significant experience of* tried to develop a program based on object-oriented concepts of inheritance and understand this concept.

click for more information  
Based on your experience about:  
I have significant experience of tried to develop a program based on object-oriented concepts of inheritance and understand this concept.

**(RO)** What are your successful and failed experiences ? ✖ Delete

*I succeeded at* able to understand the concept and write a program using the inheritance concept *because* I carefully review my lesson and take time to conduct trial and error to write down the program.

click for more information  
Based on your reflection on the experience about:  
I succeeded at able to understand the concept and write a program using the inheritance concept because I carefully review my lesson and take time to conduct trial and error to write down the program.

**(AC)** What have you learned from the experience ?

I

click for more information  
Based on your abstract concept about:  
\_\_\_\_\_

**(AE)** What will you use for learning next ?

Clear
Edit
Submit

**Teacher's Comment**

Please try to use sentence openers to learn how to reflect on your experience

click for more information  
**Sentence Openers**

✓ **Concrete Experience (CE) --> Reflective Observation (RO)**

✓ **Reflection on significant experience**  
Based on my significant experience about ... I observed that ...  
I have significant experience of ... I succeeded at ... because ...  
My meaningful experience is ... I think this experience is significant because ...

✓ **Reflection on successful experience**  
Based on my accomplishment of ... I succeeded in ... because ...  
Based on my success experience of ... I observed that ...

➤ **Reflection on failed experience**

✓ **Reflection on past experience**  
I use my previous about ... into a new context. I think this experience is significant because ...  
Based on my previous experience with ... from the successful experience mentioned above, the reason for this success is because ...

✓ **Reflective Observation (RO) --> Abstract Conceptualization (AC)**

➤ Learning from reflection of successful experience

➤ Learning from reflection of failed experience

➤ Learning from reflection of significant experience

➤ Draw a conclusion from experience

✓ **Abstract Conceptualization (AC) --> Active Experimentation (AE)**

➤ Refine knowledge from experience

➤ Continuous improvement

➤ Plan to try out what I have learned from the experience

Figure 5.1 The primary user interface for the learner

## 5.2 The recursive thinking reminder function

As research (Kingkaew et al., 2019) that is discussed in chapter 3 also points out, most learners cannot use deep thinking on EL concepts and do not realize the use of past experience into the new experience for reflective writing based on EL or recursiveness of experience, as described in figure 5.2 and 5.3. The learner plan based on what they learned during the experience and then plan and test in the coming week.

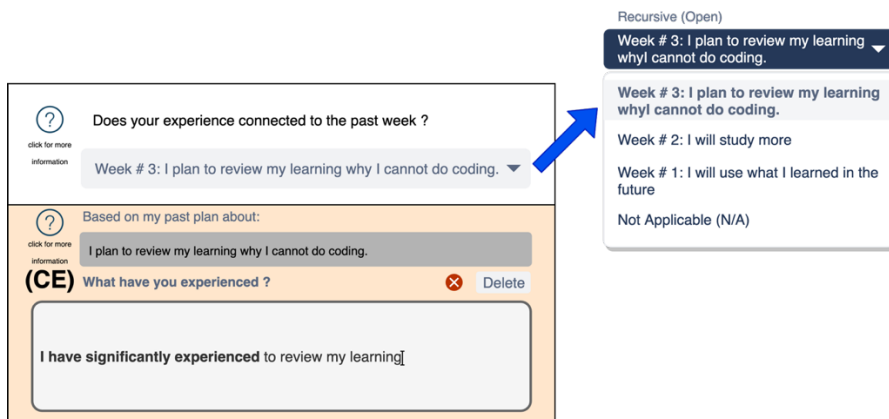


Figure 5.2 The user interface of the recursiveness of experience function. The function provides the connect the past planned experience.

The EL is a recursive process that is sensitive to the learning situation and what is being learned. Learning is a continuous process grounded in experience, and all learning is relearning.

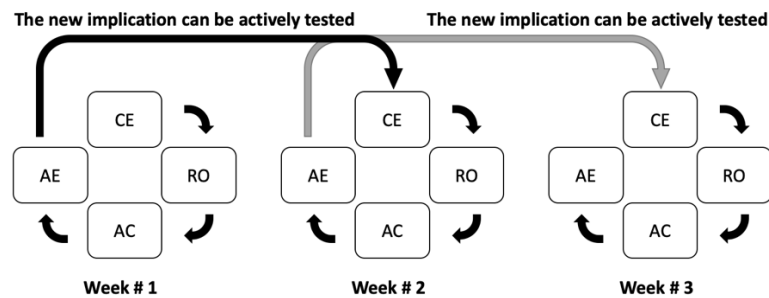


Figure 5.3 the recursive concepts of EL

### 5.3 The verbalization support in EL function with Sentence Openers

In a normal situation, the learner can easily think shallow and write shallow to describe a direct experience or low-level reflection (Wessel & Larin, 2006) in the reflection report because the learner feels more comfortable to do. The sentence opener is verbalization support of EL and SRL concepts, which promote deep thinking by suppressed shallow thinking to avoid the attitude of no-good reflection. Once the learner uses deep thinking, then the concepts can be acquired. The phenomena are illustrated in figure 5.4.

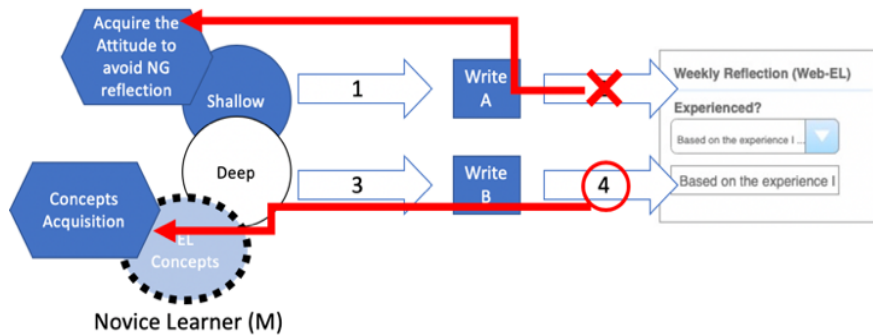


Figure 5.4 How the learner thinks and write

The sentence is structured using the hierarchy of EL and SRL concepts as a sentence. The top hierarchy is the transition between the phase of EL to support the integration between modes of EL learning. Follow by the sub-category of the concepts of EL. For example, figure 5.5 demonstrated the learner selecting a sentence “Based on the experience I had planned from the past week about ... From that experience, yet what did not go according to plan is ... because”. The sentence is split into two parts. The sentences to assist the integration of CE to the RO phase as the learner might not realize that one phase’s output can be another stage input.

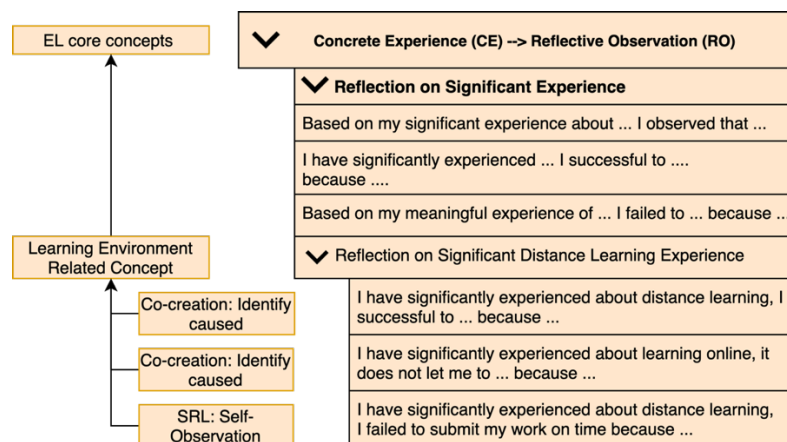


Figure 5.5 The sentence openers structure

The structure of the sentence openers is as follow in table 5.1:

Table 5.1 The structure of the sentence opener

Concept	Sub-concept	Example of the combination of sentence openers
CE to RO (Divergent Thinking)	Reflection on significant experience	<ul style="list-style-type: none"> <li>• (CE) The most significant experience was ... (RO) I am successful at ... because ...</li> <li>• (CE) I have significant experience of ... (RO) I succeeded at ... because ...</li> </ul>
	Reflection on successful experience	<ul style="list-style-type: none"> <li>• (CE) My successful experience is ... (RO) with that experience I am successful at ... because ...</li> </ul>
	Reflection on failed experience	<ul style="list-style-type: none"> <li>• (CE) Based on my failed experience about ... (RO) the reason for my failure is ...</li> <li>• (CE) Based on my failed experience about ... (RO) I failed to ...</li> </ul>
	Reflection on past experience	<ul style="list-style-type: none"> <li>• (CE) I use my previous about ... into a new context. (RO) I think this experience is significant because ...</li> </ul>
RO to AC (Assimilative Thinking)	Learning from reflection of failed experience	<ul style="list-style-type: none"> <li>• (RO) From my observation of my experience that ... (AC) I can conclude that ...</li> </ul>
	Learning from reflection of successful experience	<ul style="list-style-type: none"> <li>• (RO) The successful reason ... (AC) I learned that ...</li> </ul>
	Learning from reflection of	<ul style="list-style-type: none"> <li>• (RO) I think this experience is significant because ... (AC) I crystallize that ...</li> </ul>

	significant experience		
	Draw a conclusion from experience	• (RO) I am successful at ... because ... (AE) I can summarize that ...	
AC to AE (Convergent Thinking)	Refine knowledge from experience	• (AC) From my conclusion that ... (AE) I will need to ... to ...	
	Continuous improvement	• (AC) I learned that ... (AE) To continue to... I will need to ...	
	Plan to try out what I have learned from the experience	• (AE) To fix my mistake about ... (CE) I will ...	
AE to CE (Accommodative Thinking)	Recursive thinking	• (AE) I will need to ... to ... (CE) Based on previous learning about ... • (AE) To fix my mistake about ... (CE), I will ... • (AE) I continue to ... (CE), I will need to ...	

We adopt the following criteria for designing our sentence openers as in table 5.1. First, we collect the theoretical foundations for designing the sentence openers. Second, we select suitable sentence opener candidates based on the theory. Lastly, we reorganize and categorize the candidates into groups.

In the first step, we carefully survey the related literature to find the best sentence opener candidates. First, Kolb, 2009 provides the core EL concepts, and this serves as our primary source. This book describes EL-related concepts such as gaining and transforming experience and creating knowledge by connecting two processes (e.g., divergent, assimilating, convergent, and accommodation knowledge). Second, the MSS (Altindag, 2014) has 30 questions on the metacognitive skills required for EL. Hence, the MSS can guide the design of the sentence openers for the in CE and AC concepts. Third, the concept of self-regulated learning

by Zimmerman *et al.* contains related knowledge on metacognition skills such as forethought, self-reflection, self-control, and observation skills. We select self-regulated learning as prior knowledge because it mutually reinforces EL skills (Alvi et al., 2020). Fourth, Moon (2009) describes reflective writing and reflection.

In the second step, we create a list of candidate sentence openers based on the theoretical materials surveyed. We use the concepts extracted from the surveyed materials to consider what types of sentences represent those concepts (e.g., what kind of metacognitive thinking can be promoted by reflective writing). To promote the gaining and transforming of experience, we apply this knowledge to guide the design of the sentence openers. Table II shows examples.

The prehension dimension comprises the two distinct ways an individual can acquire information about the world: direct experience and the recreation of experiences:

- CE (Apprehension): The sentence opener promotes thinking by writing the concrete selection, thereby reminding learners of CE based on apprehension, which relies on the immediate, tangible qualities of experience.
- AC (Comprehension): The sentence opener promotes thinking by writing the conceptual interpretation of the symbolic representation of experience based on comprehension, an individual's reliance on conceptual interpretation, and symbolic representation.

The transformation dimension comprises the two distinct ways an individual interprets and acts on information:

- RO (Intention): The sentence opener promotes thinking by writing the observation of CE based on intention, thereby reflecting internally on the various characteristics of their experiences and ideas.
- AE (Extension): The sentence opener promotes thinking by writing the plan as a guide to creating new experience based on extension, thereby testing the ideas and experiences in the real world.

To promote the knowledge gained from connecting the EL processes, the combination of grasping and transforming experience results in four fundamental forms of knowledge. We apply this knowledge as a guide of how to think to join EL processes (Table 5.1 shows some examples of sentence openers):

- CE to RO (Divergent Thinking): Grasps experience and transforms.
- RO to AC (Assimilative Thinking): Experience is absorbed through comprehension and transformed through intention.
- AC to AE (Convergent Thinking): Grasps via comprehension and transforms via extension.
- AE to CE (Accommodative Thinking): Experience is grasped via apprehension and transformed via extension.

In the third step, we categorize the sentence openers into a hierarchy, as shown in Table IV. The categorized sentences represent the structure of the user interfaces (Fig. 5.1). Each category shows the similarity between concepts to increase their understanding, particularly the commonalities between parent or sibling concepts

The various candidates for sentence openers requires the learner to reflect, question, compare, and evaluate to decide on the sentence opener that reflects their experience, which encourages them to think deeper. First, the learner decides to use a particular candidate. For example, the phrasing “(CE) I have significant experience of ... (RO) I succeeded at .... because ...” is a combination of the CE to RO process with reflection on the significant experience category. This sentence is split into the text fields of CE and RO (Fig. 5.1). The learner must recall which experience to use as an input in CE and select which reflection of experience in RO by reflective writing. Then, the learner will write what they think. These learning actions of the learner, including opening the list of candidates, browsing, using it for writing, and writing time, are helpful for mentors to interpret how learners learn EL concepts. These learning behaviors tend to be implicit because they cannot be observed. To capture the values of these thinking behaviors about using sentence openers to be able to make it observable, we need the learning sensor role to detect the usage of the sentence opener function, as discussed in the next section.

#### 5.4 The teacher user interface

The teacher user interface consists of four main parts. The function helps the teacher give a comment and feedback and motivate the learner to learn based on EL and SRL concepts, the sentences (see more in appendix L) shown in table 5.2, and the user interface design as figure 5.6. The comment and feedback are not available during learning activities but is given after a task has been completed or a test of achievement has been administered (Butler & Winne, 1995). It is vital because theory and research show that it affects motivation (Weiner, 1992).

Table 5.2 The Mentor/Teacher Comment and Feedback

Type of Sentence (Goal)	Sub-Category	Sentences
[1] To admire the learner	(CE) Admire Learner that can comprehend the experience	<ul style="list-style-type: none"> <li>You done good on grasp an experience</li> </ul>
	(RO) Admire Learner that used deeper Reflecting on the experience	<ul style="list-style-type: none"> <li>You can perform very good reflection</li> </ul>
	(AC) Admire Learner that able to generalization of what has reflected	<ul style="list-style-type: none"> <li>You can use your deep thinking to generalize a concept</li> </ul>
	(AE) Admire Learner they can use what they plan from what the learner learns	<ul style="list-style-type: none"> <li>You have a good plan to apply during this week</li> </ul>



<b>[2] To promote</b> the learner	(CE) Promote Learner to comprehend the experience	<ul style="list-style-type: none"> <li>• Please try to grasp better experience</li> </ul>
	(RO) Promote Learner to use deeper Reflecting on the experience	<ul style="list-style-type: none"> <li>• Try to think deeper for reflection</li> </ul>
	(AC) Promote Learner to generalization of what has reflected	<ul style="list-style-type: none"> <li>• Try to think deeper for a new concept</li> </ul>
	(AE) Promote Learner to plan better from what the learner learns.	<ul style="list-style-type: none"> <li>• Try to use what you have learn in your next chance</li> </ul>
<b>[3] To encourage</b> the learner to use what they learn in the next chance	Encourage the learner to use what they have learned to the next chance	<ul style="list-style-type: none"> <li>• Please use this experience next chance in a different context.</li> <li>• Please use what you have learned to plan better for the similar situation.</li> </ul>

The user interfaces include:

1. **The learner's report** - the function to display the learner's weekly reflection where the teacher/mentor can observe the how the learner reflects their learning and how they connect the past and the selection of sentence opener.
2. **Admire function** - a ready-to-use sentence to assist the teacher in giving feedback that shows that the learner has good learning based on EL concepts helps teachers learn EL concepts and promote EL concepts to the learner.
3. **Promote function** - a ready-to-use sentence to help the teacher give feedback that shows that the learner needs to improve learning based on EL concepts helps teachers learn EL concepts and promote EL concepts to the learner.
4. **Encourage function** - Encourage to use the experience in the next chance to support the learner's recursiveness of experience.

5. **Teacher/Mentor Comment and Feedback Guideline** – Teacher and Mentor can use this function to motivate them to learn through EL cycles.

The screenshot displays the 'Teacher Dashboard' interface. At the top, it shows 'You are now in Week: 11' with a navigation bar. Below this, a student's profile is shown for 'Display Week: 11' and 'Student Number: 1'. The student's 'Unique ID' is YgujxPih5aPKGLH7T5MmBsSg0ch1. The student's reflection includes sections for 'Past Plan', 'CE', 'RO', 'AC', and 'AE'. A 'Teacher Comment' section follows, containing a 'Sentence Opener Use' and a 'patch url'. Below the reflection, there are buttons for 'SHOW LEARNER'S HISTORY' and 'COMMENT GUIDE'. A 'To view the log history Please press the button above.' message is also present. The interface is divided into two columns: 'Admire / Reward appreciation' (green header) and 'Improvement' (red header). The 'Admire' column shows a list of reflection points with a '2' next to it. The 'Improvement' column shows a list of reflection points with a '3' next to it. Below these columns is a 'Further Development' section with a 'Next Chance' message and a '4' next to it. At the bottom, there is a 'Comment and Feedback' text area and buttons for 'COPY COMMENT' and 'COMMENT'.

Figure 5.6 The teacher and mentor user interface

## 5.5 Collaborative Learning (Feed Function)

The web-based system allows the learners collaboratively to learn by observed other learners' weekly reflection reports by the feed function as figure 5.7.

Please study from the recommended examples. To improve learning through their own experience / reading Feed and knowledge.

Recommended memos from week 9

**Used my past experience:** I plan to continue tutoring with friends and add more tutoring. In order to resolve every question in learning between my friends and me

**CE:** From my experience with tutoring with friends. Various questions were asked. Many in the practice of tutoring.

**RO:** From that experience, what is achieved is more knowledge. I have noticed that tutoring with a friend will come across questions that we sometimes fail to think or miss.

**AC:** In self-reflection, I learned that tutoring with a friend is better than tutoring alone, as it will share more problems and doubts.

**AE:** I will do a test if tutoring with a friend can get me to the final exam.

**Comment:** Plans are taken from past experiences. Come as a lesson to continue this week. The initial sentence is used. To understand the theory of experiential learning (Experiential Learning) is a good reflection of the cause of success. There is a good use of ideas to create abstract ideas. Have a clear plan based on what has been learned and can be tested. Please use this week's plan for the next week. Together with explaining the outcome of the planning success or failure including reasoning analysis Please take the ideas from this week. To be used in other events in the same context in the future

**Have used past experience:** I plan to practice doing a GUI in order to increase my knowledge. And able to apply the knowledge gained to develop in order to write programs for their own children to play and use

**CE:** Experience with practicing GUI.

**RO:** From that experience, what is successful is to create a pattern so that the user can use it without writing code. Because we made it to be easy to use. There is no complicated procedure. From the above successful experiences The reason that this was achieved was due to more studies from the internet. And practice doing many forms

**AC:** To learn that the principles of doing what are the steps. How to do anything to prevent errors What kind of program to do to make calculations faster? New knowledge gained from self-reflection from success is that if we don't do something, it will not always be possible. So it's not like we can't. But we still do not know. And we still can't

**AE:** I plan to develop my project to be faster. So that the user will not have to wait for a long time to think or process the machine.

**Comment:** Plans are taken from past experiences. Come as a lesson to continue this week. The initial sentence is used. To understand the theory of experiential learning (Experiential Learning) is a very good reflection of the causes of success as it analyzes the causes of success. There is a good use of ideas to create abstract ideas. Have a clear plan based on what has been learned and can be tested. Please use this week's plan for the next week. Together with explaining the outcome of the planning success or failure including reasoning analysis

Feed - Weekly Note 10 (Last Update: 05/08/2020 at 14:30)

<p><b>Have you used past experiences ?:</b> Bring the experience gained from learning to develop to better understand.</p> <p><b>CE:</b> I have learned and understood more GUI programs that have been coding to add functionality to the program. Including making the button work as needed</p> <p><b>RO:</b> I can follow and understand in class how the code in the button works, but when I try it myself, I still can't write it to work as I want.</p> <p><b>AC:</b> I need to study more functions and coding in order to build on my knowledge and allow myself to understand and write my own functional code as needed</p>	<p><b>Have you used past experience or not:</b></p> <p><b>CE:</b> Dear oop</p> <p><b>RO:</b> I don't understand the timekeeping code.</p> <p><b>AC:</b> Search the Internet for more information.</p> <p><b>AE:</b> used in the next exam</p> <p><b>Comment from the teacher:</b> Analyzing their own learning is not very detailed. I haven't mentioned the experiences that create learning. Still analyzing the factors why success or failure is not detailed enough. As for what has been learned in AC, it should not be mentioned what has been learned. But</p>	<p><b>Have you used past experiences ?:</b> Keep improving your abilities and helping others.</p> <p><b>CE:</b> Based on the experience I planned over the past week with java GUI studies, it is possible to run smoothly with the squat.</p> <p><b>RO:</b> I use it in the study of GUI, its result is the ability to study effectively and understand the assignment.</p> <p><b>AC:</b> Keeping up with the content you are studying beforehand can give you a better understanding of the content you are going to study.</p> <p><b>AE:</b> Always improve and develop ourselves better so that the knowledge</p>
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Figure 5.7 The Feed User interface

The teacher can recommend a good description as an example. So, the learner can learn and abstract from a good example, as shown in figure 5.8.

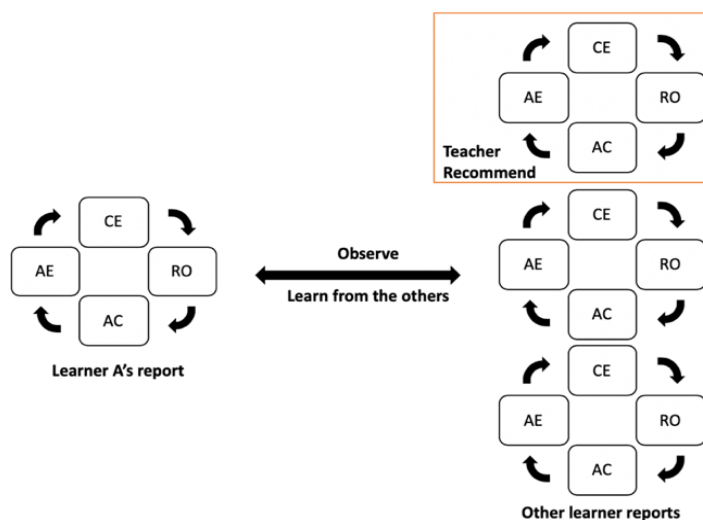


Figure 5.8 Collaborative Learning by observing and learning from the other learners' reports

## 5.6 The Learning Sensors as one role of the sentence opener function

One problem in the learning system is how to evaluate the learners as there are various ways to do so. The evaluation of the system to see the learner's changes can be done in many ways. For example, we can use the questionnaire to ask about the learner's feeling in learning achievement, analyze of the report writing or we can use the self-reflection form to let them reflect on how well they learn EL concepts. Also, the quiz to ask them to define the EL concepts. However, those evaluation methods only compare the change from before and after. Using the learning sensors to capture the implicit learning phenomena such as time, thinking sequence, thinking pattern. We can observe how the learner changes step-by-step in detail. We use the data for the learning visualization to visualize the changes.

To provide an observation interpretation of the EL thinking process, we design a support function for mentors that visualizes learners' thinking behaviors on EL processes. This visualization represents their tendency to change their writing style. Mentors use this visualization to diagnose learners' status and provide them with comments and feedback.

The learning behavior patterns are now defined as the structure:

- **The learning behavior pattern name** – the expected learning behaviors in order to achieve the learning goals.
- **The value of the pattern** – The behavior pattern that can be captured by the learning sensors that tells the stages of learning.
- **The diagram** – The diagram that represent the behavior state.

Based on the learning goals, we try to capture these pattern as shown:

### 5.6.1 Recursive Learning Behavior/ Sentence opener learning behavior

Next, understanding learners' behavior is essential for mentors to offer comments and feedback to improve the former's EL processes. Such knowledge of learning behavior patterns is prepared in advance based on the desired learning behavior. For example, this may indicate the change in writing style observed from learners' use of sentence openers, as Fig. 5.9 shows. We design the pattern based on what kind of trial-and-error process can be observed from learners. These changes in behaviors can offer insightful information for mentors to determine learners' changes in writing style. The color's magnitude represents the cue's strength, which shows the different values captured from the learning sensor. A stronger cue represents the expected behavior, which shows that learners have learned from the support function.

For example, as shown in in Fig. 5.9(A), sentence opener learning behavior (SO) occurs when learners select a sentence opener and then write a reflection continuously for at least a week. A weaker cue shows that learners are starting to use the sentence opener through trial and error. When learners try to connect their experience with the EL concepts, they may write down their experience and reflect on whether it is good for abstraction. Then, they try to choose an experience again, indicating that learners may be thinking deeper to evaluate the use of a certain one. Using the sentence opener is represented by a light dotted line (choosing a sentence opener category), dotted line (browsing that category), and bold line (selecting a candidate). As shown in Fig. 5.9 (B), recursive learning behavior occurs when learners select a previous experience on the recursive experience list and use it with the sentence opener to describe the connection between the past and present continuously for at least a week. A weaker cue may indicate that learners are using their past experience, but that such experience may be unsuitable for abstraction. Then, they try to make a new one that is best for EL processes. Fig. 5.10 (C) shows the learning process events that match the pattern over time.

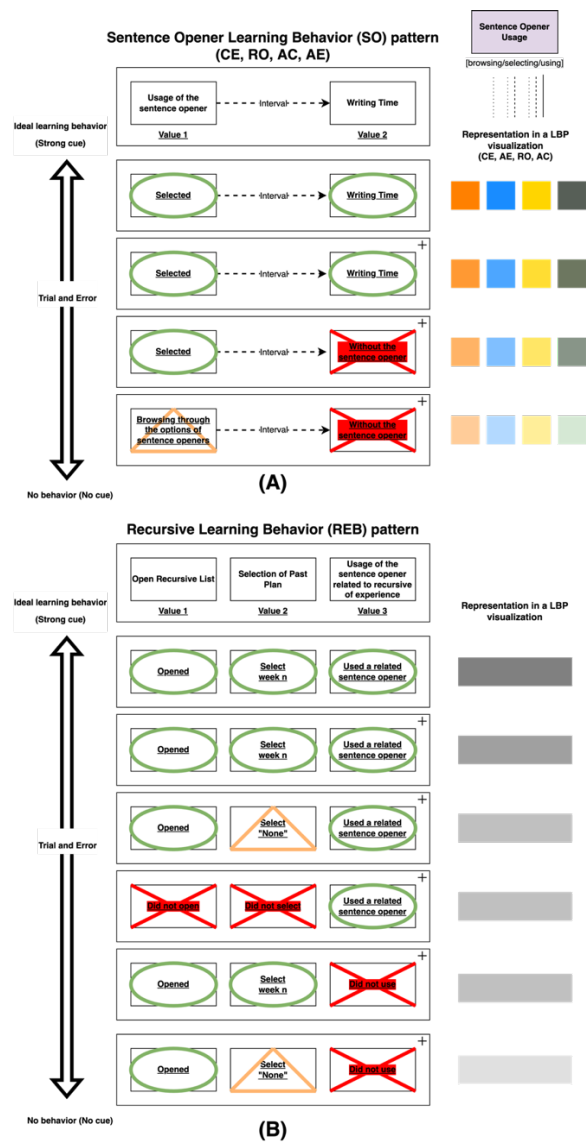


Figure 5.9 Learning Behavioral Patterns (LBPs) for trial and error in EL

## 5.7 Visualization of learner's thinking behavior function

In one example in (Woolf, 2010), the learning environment involves a cardiac arrest tutor. In this environment, learners' goal is to be able to observe the vital signs and make good decisions based on their cardiac arrest treatment knowledge. Learners can learn what they should change in detail (e.g., right or wrong procedures), as their knowledge clearly shows them how they should perform operations. These failures allow learners to understand which sign is vital in which situation. The system can note their lack of judgment and provide them with feedback. Meanwhile, for meta-level thinking training in EL, learners' aim to become aware of EL processes. They try to learn to apply EL concepts by connecting their CE to an abstract concept of EL. However, learners do not have an exact procedure for what they should do. It is thus difficult for them to clearly understand when and what EL knowledge to apply, as the learning process is implicit. When learners desire an experience in CE, they determine whether this experience is good for abstraction. If they realize that, they retry from the selection of CE. Therefore, trial and error are needed for them to understand the connection between the four EL processes and how to select a good CE for the EL cycle.

To interpret the observation of the EL thinking process, we design the learning sensor role to capture the usage of the learning objects in this learning environment. Therefore, the learner's actions are captured by the learning sensor role. Such actions include:

- Clicking to expand the sentence opener at the root node at time t1.
- Browsing through candidates of sentence openers at time t2.
- Writing text after the selection of the sentence opener at time t3.
- Changing sentence openers at time t4.
- Selecting the sentence opener category (CE to RO) at time t5.
- Finally selecting the sentence opener choice (# SO-2-3-1) at time t6.
- Deleting the sentence opener choice (# SO-1-1-6) at time t7.

Each action of these learner's events is represented by the 4-tuples data structure (object, action, key, and time) or sensing data that extract values when the learner learned EL through the learning environment, as shown in Fig. 10 (A).

- **Object:** The learning object in the user interface (shown in table 5.3) with which learners interact, such as the sub-category of sentence opener in the CE and RO category, CE's text field, sentence openers list, and recursive list.
- **Action:** An action value that learners do. For example, they select or browse the sentence opener options by typing, opening the list, and deleting.
- **Key:** The value that learners input, such as the selected sentence opener, category of the sentence opener, choice of the previous week's experience, and use of text.

- **Time:** The period in which learners' events happened.

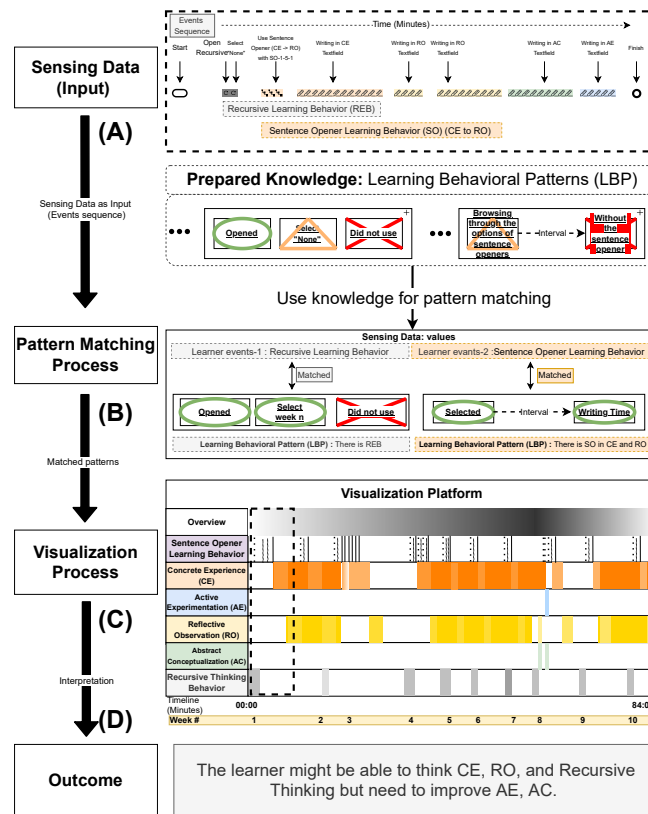


Figure 5.10 How visualization function of learner's thinking behavior works.

Visualizing learners' examples represents the interpretation of the observation as the tendency to change. Fig. 5.10 (D) shows the example of one interpretation (see also the examples in chapter 6) to see how learners develop metacognitive thinking on EL processes. Each row represents each EL concept within the learning behavior. Visualizing learners' thinking process helps mentors observe their thinking behaviors as a learning process, with the reflective writing report the outcome. This information helps interpret learners' learning status to provide them with the appropriate support. The visualization represents how learners think when using support functions such as the recursive thinking reminder function and sentence openers. The sequence of learning events (object, action, key, and time), as shown in Fig. 5.10 (A), will become the input into the function, which aims to extract values' input data by pattern matching, as shown in Fig. 5.10 (B). Once matched with the pattern, this visualizes the matched events to show their cue level and time of occurrence. The output of the learning behavior pattern function is the visualization as an observation interpretation, as shown in Fig. 5.10 (C). This represents how each learner learned to think to acquire EL concepts.

The learning behaviors are detected and interpreted into the meaning of those behaviors, as table 5.3 described learning object, actions, values. This learning objects are design to make implicit thinking visible.



Table 5.3 The User Interface object and interpretation

Type	Object ID	Object	Event ID	Event	Time	Content
<b>List (Dropdown Menu)</b>	SPE1	Selection of the past experience	SPE- Click	Click	SPE-Click- startTime	Selection of the past experience in order to promote recursive function of EL
			SPE- Item- Selection	Item- selection	SPE-Item- selectionTime	
<b>Body</b>	ELBody	Page Body	PageOpen	Page open	PO-startTime	When page is open
<b>Text Field</b>	Cetext	Writing of Concrete Experience	CE-select	click	CE-click- startTime	The leaner writes CE part
			CE-type	type	CE-typeTime	
			CE- release	Leaves an input text field	CE-release- endTime	
	RotextF	Writing of Reflective Observation	RO-click	click	RO-click- startTime	The leaner writes RO part
			RO-type	type	RO-typeTime	
			RO- release	Leaves an input text field	RO-release- endTime	
	ActextF	Writing of Abstract Conceptualization	AC-click	click	AC-click- startTime	The leaner writes AC part
			AC-type	type	AC-typeTime	
			AC- release	Leaves an input text field	AC-release- endTime	
	ActextF	Writing of Active Experimentation	AE-click	click	AE-click- startTime	The leaner writes AE part
			AE-type	type	AE-typeTime	

			AE-release	Leaves an input text field	AE-release-endTime	
	MentorTextF	Mentor's Comment	MT-click	click	MT-click-startTime	The learner read the teacher comment
			MT-release	Leaves an input text field	MT-release-endTime	
<b>Button</b>	Submit	Submit button	Submit-click	click	PO-endTime	When the learner finish to write all
	Edit	Edit button	Edit-click	click	Edit-endTime	When the user edits
	Hint	Hint button	Hint-click	click	Hint-clickTime	User click hint button
<b>Nested List</b>	SO	Sentence Opener nested list	SO-click	click	SO-click-startTime	When the learner uses the sentence opener function
			SO-subcat-select	click	SO-subcat-clickTime	
			SO-sentence-select	click	SO-sentence-selectTime	

# Chapter 6

## Exemplifying EL in learning environment

In this section, we show how learners learn EL concepts in this learning environment to promote metacognitive thinking in EL through reflective writing. Mentors use learners' data generated in this learning environment to provide them with appropriate feedback. Fig. 6.1 shows the experimental design, which distinguishes the data needed to learn in this learning environment. In addition, we survey learners' and mentors' perspectives to understand their impressions of this learning environment.

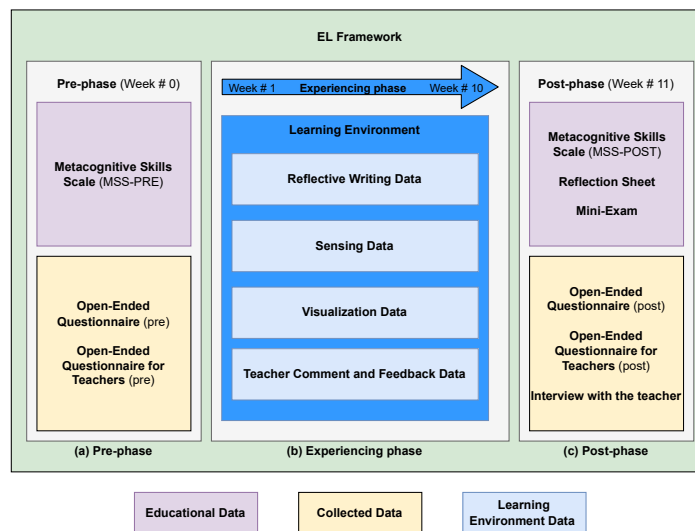


Figure 6.1 The education program to teach EL concepts

The case studies show how the mentor can integrate all data to give the meaningful learner's interpretation about their learning status. Furthermore, the interesting case studies show the interesting phenomenon, including the different learning processes, show the various types of learners from the visualization, and show how the visualization benefits and relationship with MSS, Reflective Writing Data.

Table 6.1 (a) The Summary of Case Studies

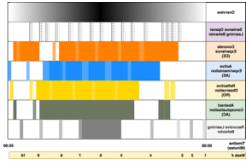
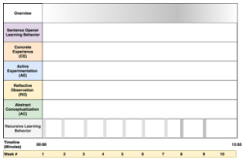
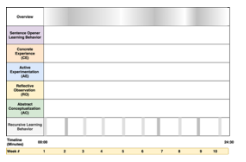
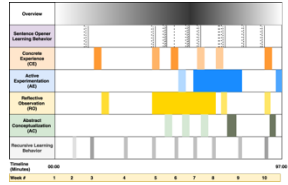
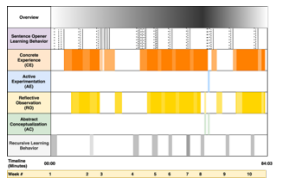
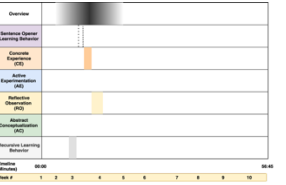
Data	Case Study 1 (1)	Case Study 2 (2)	Case Study 3 (11)
LBP (Process)	 <p>(Good)</p>	 <p>(Bad)</p>	 <p>(Bad)</p>
MSS (Self-Assessment)	2.90 -> 3.97 (Bad--> Good = Good)	2.97 -> 4.03 (Bad --> Good = Bad)	2.56 -> 2.73 (Bad --> Bad = Good)
Reflective Writing Data ***details omitted (Result/ Output)	(Good)	(Bad)	(Bad)
Interpretation (By Mentor)	<p>The learner can accurately access themselves</p> <ul style="list-style-type: none"> <li>The mentor praise the learner in learning and self-assessment</li> </ul>	<p>The learner cannot accurately access themselves</p> <ul style="list-style-type: none"> <li>The mentor promote the learner to learn more</li> </ul>	<p>The learner can accurately access themselves</p> <ul style="list-style-type: none"> <li>The mentor praise the learner for accurately self-assessment but need to promote the learner to learn</li> </ul>
Interesting Phenomena	The learner that become aware of EL concepts	Poor self-monitor learner	Good Self-monitor Learner with poor progress and Bad result (only learn Recursion Concept)

Table 6.1 (b) The Summary of Case Studies

Data	Case Study 4 (17)	Case Study 5 (12)	Case Study 6 (10)
LBP (Process)	 <p>(Good)</p>	 <p>(Bad only Recursion, CE and RO)</p>	 <p>(Bad)</p>
MSS (Self-Assessment)	3.57 --> 3.63 (Good --> Good = Bad)	3.97 --> 4.5 (Good --> Good = Bad)	3.23 --> 4.07 (Good --> Good = Bad)
Reflective Writing Data ***details omitted (Result/Output)	(Good) <ul style="list-style-type: none"> <li>No use of functions on # 4 and # 9</li> </ul>	(Bad, Good in CE, RO)	(Bad)
Interpretation (Mentor)	The learner cannot accurately access themselves <ul style="list-style-type: none"> <li>The mentor show that the self-assessment on pre-learning is inaccurate</li> </ul>	The learner can accurately access themselves <ul style="list-style-type: none"> <li>The mentor praise the learner in learning and self-assessment</li> <li>The mentor should promote AE and AC concepts for the learner</li> </ul>	The learner cannot accurately access themselves <ul style="list-style-type: none"> <li>The learner only try to learn in the beginning week</li> <li>The mentor should encourage the continuity of learning</li> </ul>

Interesting Phenomena	Bad Self-Evaluation Learner with Good progress and good result (Show the role of mentor to keep the learner learn)	Bad Learner because Recursion, CE, RO Competence Learner	Bad Learner
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### 6.1 Case Study # 1: Learner that may become aware of EL processes (CE, RO, AC, AE)

To perform the data analysis, we combine all aspects of the data analysis framework. In the beginning, the learner asks to do the questionnaire that measures the EL competency level and also the metacognitive skills. For ten weeks of the distance learning experience in Object-Oriented Programming (OOP), the learner uses the system to learn EL by reflective writing about their learning in the distance learning experience. To see the learner change, we analyze the reflective writing data and combine it with the learning behavior patterns detected from the learning sensors. After the learner finish the course, we do the questionnaire to survey how the learner change in the aspects of the satisfaction in using the system, reflection on their learning, recognition of change in learning and attitude, the mini test to see how the learner developed EL knowledge and measure the MSS score to confirm about the metacognitive skills.

As table 6.2, the learner evaluates lower than the class average. For Factor 1 of MSS, which is related to Metacognitive Knowledge, the learner assesses lowest among other categories. The learner realizes the benefit of DL to learning. The learner somehow realizes the concepts of EL. The learner said to use cognitive strategies to keep their learning smooth in DL. The learner also realizes the challenge of DL compares to a regular classroom. The lecture's primary goal is to offer an overview of Experiential Learning knowledge (facts or concepts). The lecture contents are knowledge of EL, benefits of EL, 21<sup>st</sup>-century skills, instruction on how to use the web-based system. The purposes of the lecture are to present the learning objective (The learner realize that they need to write the weekly report and think of something new that they are not thinking before), establish attention, direct learner's attention toward the learning, enhance the motivation to learn and provide guidance for the learner to learn EL. The knowledge can be transfer from one to another and can be acquired through observation and study.

Table 6.2 Case study # 1 collected data

<b>Data Sources</b>	<b>Variables</b>	<b>Values</b>
<b>Metacognitive Skill Scales (MSS)</b>	<b>Mean</b>	2.9
	<b>Standard Deviation</b>	0.76
	<b>MSS Factor 1</b>	2.13
	<b>MSS Factor 2</b>	3.23
	<b>MSS Factor 3</b>	3.11
	<b>Class Mean/ SD</b>	3.29/ 1.03
	<b>Class MSS Factor 1 Mean/ SD</b>	3.24/ 1.03
	<b>Class MSS Factor 2 Mean/ SD</b>	3.29/ 1.05
	<b>Class MSS Factor 3 Mean/ SD</b>	3.33/ 0.99
	<b>Open-ended Questionnaire</b>	<b>Realization of the benefit of Distance learning to EL and SRL</b>
<b>EL Knowledge</b>		learning and working at the same time to gain more experience.
<b>SRL Strategies</b>		Pay attention to the learning, try not to be stressed, I prepared myself to review on coding, after I finish for each week, I will review the knowledge, I will pay attention to get A grade.

<b>Realization of the disadvantage of DL to EL and SRL</b>	The attention to study is less than in the classroom so that the understanding is lower.
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The learner has no conscious of Experiential Learning (EL) concepts before, so that the learners do not have a skill or knowledge yet. They do not realize the usefulness of EL concepts. The system's orientation is the lecture for the learners to learn the basic concepts and motivate them to learn. Therefore, the learner gains the motivation to learn EL concepts by **a class orientation**, an educational program to provide them EL knowledge and realize how to apply the knowledge learned by reflective writing using a web-based system. Also, the content in the lecture shows the benefits of doing EL activities through the class. The main goal of **the beginning of using the framework** is to transfer the knowledge learned in the lecture into practice. In the beginning, the learner can perform the action by doing a weekly report to gain skills based on EL concepts. The learner starts to practice doing a weekly report; they may do not know how to do it, and the learner may not recognize the deficit in the first place. After that, the learner starts to recognize their incompetence, the value of the new skill. The learner makes mistakes, but these mistakes are the learning process so that the learner can improve their performance until they master it.

The skills can be developed better if one has prior knowledge (lecture) to accomplish the task. When the learner starts to do a weekly report, at the time they reflect, they realize they recall what the lecture content told and realize something from it.

As demonstrated in table 6.3, we represented the weekly report data from week 1 to 5 with data sources and variables that we measured. The learner started to learn about EL concepts by course orientation to learn the important EL concepts and enhance the motivation to learn EL concepts by the weekly report. **During the first week**, the learner learned EL through the course orientation and read through guidelines. The learner started to use the system to do reflective writing about their learning in the subject. The learner applies what they learned from the lecture and put into practice in the system. Based on EL description, the learner able to describe their learning at the shallow level. RO is shallow, and AE is too broad. The learner seems to understand AC more than other learners. The learner uses a short time to complete each EL process as they do not think carefully but simply write it down.

**In week 2**, The learner starts to reflect deeper on both, and failed experiences related to learning. The learner starts to read the teacher's comment. The learner starts to use the recursion function as well. The learner starts to gain Reflective Observation (RO) concepts as the learner tries to analyze the factors of their success or failure. The learner's time to complete the RO part of the report as the learner reflect carefully "Success: I somehow learned something; I can do more practice exercise problems—failure: Still something that is not yet understood. Not concentrate on studying in sometimes" [1]. The learner starts to observe the teacher's comment. The AE plan is still too broad. The teacher comments on how to think about



AE. During the first two weeks, the learner seems not to use deep thinking to write the report. The time they use to complete is fast, showing that they only use immediate thinking to write the report [2].

**In week 3**, The learner uses the sentence opener based on the teacher’s comment [3]. The learner uses more time to complete the increase significantly as they carefully think about the EL concepts affected by the sentences [4]. Especially the RO part, which takes 3.06 minutes to complete. The learner still does not connect the past plan in the future.

**In week 4**, the learner started to show the metacognitive skills as they try to use the strategy to improve their learning skills, as observed from the AE part of week 4. The learner takes more time to complete AE than weeks 1 to 3 because they think carefully about their learning strategy [5]. The learner uses the same sentence opener as last week. The learner said they use the past plan but did not connect with the past plan. The teacher encourages to connect past plan with the experience in the future.

**In week 5**, the learner starts to realize the importance of the recursiveness of experience that the learner connects the past plan and apply into this week [6]. This is the first time that the learner tries to connect the past plan to the present. The learner shows the metacognitive strategy gained by using the sentence opener [7]. The learner can connect the past plan from the past week. However, in the description, we cannot see the real connection.

Table 6.3 The analysis of the learner on the report writing with time use in each process from tracking function (Week # 1 - 5) (A good learner)

Week #	SPE	SO	CE Text	RO Text	AC Text	AE Text
1	-	-	The first online learning experience in life. It was a little complicated, but I can pass for the first week.	I can study without sleeping. I can understand at most.	I have to work hard to get through this online education.	Use the accumulated knowledge. So that we can fit into society in daily life.
Total	-	-	0:17	0:11	0:11	0:10

1:50 mins [2]						
2	N/A	-	We can learn things that the teacher teaches quicker. It is better than the first week maybe because we're more used to online learning	Success: I somehow learned something; I can do more practice exercise problems. Failure: Still something that is not yet understood. Not really concentrate to study in sometimes [1]	Although we sometimes fail to study, we must keep moving forward for future success.	Complete all examinations for grades A ++ and can use them in everyday life.
Total 2:00 mins [2]			0:12	0:40	0:13	0:06
3	N/A	CERO: 1-4-1  ACAE: 3-1-1 [3]	<b>Based on the experience that I had planned last week about ...</b> working together with others smoothly.	<b>Based on the above successful experiences the reason that was achieved because ...</b> I have found good friends to work with. We get to know each other so my work progresses fast.	<b>The learning from self-reflection from success is ....</b> Having good friends and understanding me is also important to me.	<b>I have a plan to ...</b> learn about mistakes from working <b>so that ...</b> I can work successfully and efficiently.
Total	0:01	1:21	0:48	3:06	0:28	0:44

8:34 mins		1:07		[4]		
4	N/A	CERO: 1-4-1  ACAE: 3-1-1	<b>Based on the experience that I had planned last week about ...</b> making java project and coding	<b>Based on the above successful experiences the reason that was achieved because ...</b> Our group got the topic, content, information in which we will make an ATM program in a Java project. It will make our group work quickly and effective because ... We have enough knowledge, ability and ability to work together.	<b>The learning from self-reflection from success is ....</b> knowledge, unity, and determination to lead to success.	<b>I have a plan to ...</b> Concentrate and diligently practice the use of Java to understand and be able to solve test questions and code quickly and easily and quickly.
Total 8:16 mins	0:01	0:32 0:54	0:20	3:03	0:28	0:44 [5]
5	#4 [6]	CERO: 1-4-1  ACAE: 3-1-1	<b>Based on the experience that I had planned last week about ...</b> Learning OOP	<b>Based on the above successful experiences the reason that was achieved because ...</b> were Learned more and more	<b>The learning from self-reflection from success is ....</b> We should go back to study, review lessons, and emphasize	<b>I have a plan to ...</b> Return to review, read various content, practice coding in Java programs in order to ... take the

				efficiently because ... I went back and review some of the lessons and repeat the part that does not understand what to do [7]	things we haven't understood yet.	exam, collect points on this Tuesday to get a lot of points as much as possible
Total 4:43 mins	0:12	0:23 0:12	0:10	1:08	0:25	1:07

**In Week 6**, We can see the connection between the past plan in week # 5 and this week's experience. The learner takes a past plan strategy to better learn and reflect about it [8]. The learner **understands the concept of recursion of the experience** this week [**Recursion-Realization-NO -> Recursion-Realization-Yes: Selection of the past plan**]. The learner connects the past plan from week # 5 that the learner will do coding practice and then apply it on week 6 with the discussion with the results.

**In Week # 7**, the learner continues to use the sentence openers, but this week, the learner changes the sentence for making a reflection [9]. The change of time effect to ACAE part as the learner uses more time to complete AC and AE.

**In Week # 8**, the learner selects the sentence opener; however, the learner does not use it and writes independently [10].

**In Week # 9**, the behavior observed in week # 8 continues in week #9 and week #10 that the learner does not use the sentence opener on AC part event there is a selection of it. This week, the learner uses more time to write the report as we can observe from the tracking data that the learner uses longer time for the selection of sentence openers during writing in the RO part [11].

The report for ten weeks shows that the learner uses deep thinking for reflective writing, as we can observe once the learner starts to use the support functions such as connect to the past (Recursive) and the sentence openers. The concepts in each stage of EL are well integrated.

Table 6.4: The analysis of the learner on the report writing with time use in each process from tracking function (Week # 6 – 10)

Week #	SPE	SO	CE Text	RO Text	AC Text	AE Text
6	- (#5) [9]	CERO: 1-4-1 ACAE: 3-1-1	<b>Based on the experience that I had planned last week about ...</b> coding practice for test taking, collecting points on Tuesday to get a lot of points scores [8]	<b>Based on the above successful experiences the reason that was achieved because ...</b> I understand the exam smoothly and succeeded <b>because ...</b> I have planned on examination which topics needs to be read and practiced [8]	<b>The learning from self-reflection from success is ....</b> We should study to gain understanding the parts that are not yet understood. So, you can do feel okay to take the exam and get good scores	<b>I have a plan to ...</b> diligent, persistent practice in coding and learn about Java in OOP in order to ... have further experience working in coding in order to write faster and more accurate
Total 5:10 mins	- 0:05	0:14 0:31	0:23	0:53	0:46	1:23
7	#6	CERO: 1-1-1 ACAE: 3-1-3 [9]	<b>Based on the experience about ...</b> diligence and determination to practice making code	<b>From that experience, what has been achieved is...</b> I learned about my class faster and more accurately <b>Because ...</b> I revisit my textbooks regularly	<b>The learning from self-reflection from success is ....</b> Think you can bring it back to work Will focus on that in particular	<b>I have a plan to ...</b> will go back to study the get-set Method extended void non-void public private etc. <b>so that ...</b> I am able to

						apply this knowledge so when I study, I can return to study and work.
Total 5:10 mins	0:02	0:11 0:38	0:20	0:42	1:51	0:14
8	#7	CERO: 1-1-1 ACAE: 3-1-3	<b>Based on the experience that...</b> I study based on my plan the past ... this week I have learned about Java GUI	<b>From that experience, what has been achieved is ...</b> that I understand GUI in order to get the project out of shape. It is because ... I went back to study and understand the GUI	The GUI is not as complicated as you think <b>[10]</b>	<b>I have a plan to ...</b> go back to study and continue to practice doing GUI <b>in order to ...</b> bring it back to use for further projects. And bring it back to study and use it to continue working.
Total 7:26 mins	0:02	0:11 1:50	1:48	1:01	0:54	1:03
9	#8	CERO: 1-1-3 AECE: 4-1-2	<b>From my experience with ...</b> GUI class making with the project came out ok	<b>From the successful experience mentioned above, The reason for this success is because...</b> Me and	Making GUI classes is not as difficult as expected. But it might feel dazed and confused at first.	<b>I plan to ...</b> go back to study and develop a GUI writing and java project. <b>In order to ...</b>

				my friends Has returned to study various algorithms About writing GUI	But if returning to study well It will be easy to understand.	build on the success of learning about GUI in Organizing GUI and codes in the project to complete the project assignment
Total 9:03 mins	0:07	0:11 1:41 [11]	0:15	0:49	0:49	2:17
10	#9	CERO: 1-4-1  ACAE: 3-1-2	<b>From the experience I have planned over the past week about ..</b> Completing a project	<b>From that experience, what the plan has accomplished is ...</b> able to write project code well and continuously but still partially stuck <b>because ...</b> our group did not study the inheritance of variables completely enough. We have to go back and revise.	We will find new ways to connect values. Even better in the project	<b>I have a plan to ...</b> go back to complete a group project and go back to practice making the code <b>to ...</b> come to the final exam, get a lot of scores.
Total 3:36 mins	0:07	0:17 0:10	0:11	0:58	0:30	0:40

The tracking data can only show the time duration that the learner uses to complete the report. The interesting learning behavior patterns that we designed can be detected by the use of the learning sensors.

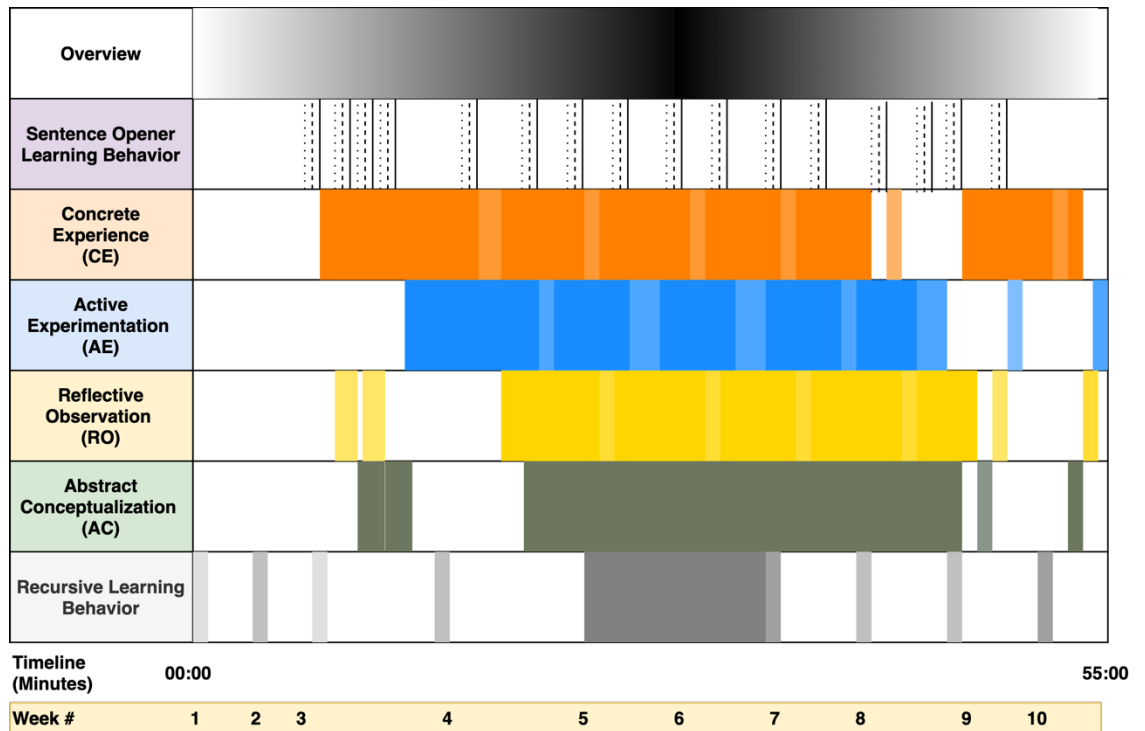


Figure 6.2 The thinking behavior patterns that captured by the learning sensors (case study # 1)

There are the intended learning behaviors that we can capture using the learning sensors. However, **unintended learning behavior patterns** are not designed during the learning design phase, but we can observe them once we analyze them. Figure 6.2 shows the thinking time shown in the white part and writing time in the blue part. The first part on the left represents week # 1 to # 5 has more thinking time between stages of EL more than the right part, week # 6 to # 10. This implies that the learner use time to think at first and then writes it down without think and write.

The MSS post-test is done after the learner finishes the course. The learner gains the confidence to use the metacognitive skills, as we can see from the increase of MSS score in self-evaluation as table 6.5 shows below.



Table 6.5 The comparison between pre-MSS score and post-MSS score

Data	Variables	Values - Before	Value - After
MSS	Mean	2.9	3.97
	Standard Deviation	0.76	1.00
	Class Mean of MSS Factor 1/SD	2.13/ 0.35	4.63/ 0.52
	Class Mean of MSS Factor 2/SD	3.23/ 0.73	3.77/ 1.17
	Class Mean of MSS Factor 3/SD	3.11/ 0.60	3.67/ 0.87
	Overcall Class Mean/ SD	3.29/ 1.03	3.98/ 0.89

The mini-exam (Appendix G) result shows that the learner learns the concept of **Recursion of the experience** very well, as table 6.6 shows below. The reflection on EL's understanding and the usage of EL is very high. The learner gain understanding and how to apply the EL concepts in their learning activity. The learner also gains a good learning attitude as he said to be more enthusiastic about studying, studying harder, diligently, and reviewing the lesson more.

Table 6.6 Mini Exam Results

Variables	Values
Q1 – EL Understanding	Very Well
Q2 – Usage of EL	Very Well
Q2.1 – “Very Well, Good, Fair”	I study and review the learned material learned to gain more knowledge and experience about difficulty is it was difficult to find the strategy to improve my mistake in learning and working
Q2.2 – “Fair, Not well, Not very well”	-

3. Reflect on Learning changes	Before	After
Attitude	Find it is boring and do not want to study	Be more enthusiastic about studying
Behavior	Lack of intention and not diligent in studying	Study harder, diligent and review my lesson more
Understanding	I think it just a theory that learn to create the experience	Thinking and analyzing yourself from your own experience of how you are? What are you doing today? Then understand it or not, how much, why, and what have you learned? What will be used?
Ability	I don't know anything about how to use it.	I able to apply what I have learned back and apply it in the future
Q4 – Most Important Concept	Active Experimentation (AE) because I will understand what I learned and apply those I learned in the future	
EL Definition (Before)	Learning and working at the same time to gain more experience.	
Q5 – EL Definition	Reviewing of what you have learned in the past, bring the experience back apply it in the future	

The reflection sheet (Appendix E) on the EL concept learning and its function (AppendixF) are used to let the learner reflect on how well they learn EL concepts as table 6.7.

Table 6.7 Reflection sheet of EL

Variable	Value
Reflection on EL	Good
Reflection on Realize of importance of EL	Good
Reflection on learning CE concept	Good
Reflection on learning RO concept	Good
Reflection on learning AC concept	Good
Reflection on learning AE concept	Good
Reflection on learning Recursion concept	Good
<b>Realization of the usage of the functions provided in the system</b>	The learner realized the benefits in helping to learn EL concepts

The learner reflected EL's learning through the system as Good in every EL concept and realized the functions' usage to support the learning well. The learner said that they connect to the experience (past AE) and the sentence openers functions help the learner best. The learner states that the learner can recognize what the plan was and connect to the current. The sentence openers function helps to assist in report writing and make the writing better. It helps the learner think critically and think carefully.

### 6.1.1 The Mentor's Interpretation based on LBP visualization

To demonstrate how the mentor can use the information from LBP visualization, the visualization on the left column shows the crucial concepts of EL that the learner learns. The timeline of learning shows the learning activities that can be sensed by the learning sensors and use the information to visualize on the LBP timeline. Each EL concept corresponds to a single color that varies by stage of learning. The overall LBP visualization can show the learning process of this learner.

Mentor's Interpretation: During the first week, the mentor observed that this learner only writes reflective writing without using EL support functions. The reflective writing in CE part is "The first online learning experience in life. It was a little complicated, but I can pass for the first week." The mentor realized that this learner still does not realize any EL concepts, as can be observed by LBP visualization; the mentor tries to promote and support to move to the next stage of learning.

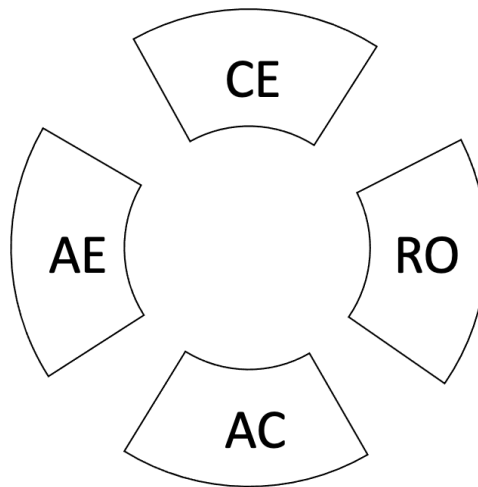


Figure 6.3 EL Learning stage of case study # 1

(1) The learner starts to learn the “Recursive” concept by select the past experience as “None” from week # 2 until week # 5.

- The mentor can observe that the learner starts to realize the concept of recursion. The mentor can use the information to promote selecting “none” and plan and connect the past experience and extend it into the future.

(2) The learner starts to trial and error to select the sentence openers on CE to RO part in week # 3, and the time it takes for deep thought to complete the sentence has increased. The CE and RO part from the reflective writing data CE: “[SO] Based on the experience that I had planned last week about ... working together with others smoothly.” The learner takes time from 12 seconds from last week to 48 seconds to complete CE part and for RO part “[SO] Based on the above successful experiences the reason that was achieved because ... I have found good friends to work with. We get to know each other, so my work progresses fast.” which takes time from 40 seconds from last week to 186 seconds in this week. The data show that the learner developed deep thinking this week.

- The mentor can observe that the learner starts to realize the concepts of CE and RO by observation from the use of CE, RO sentence openers that display on LBP visualization.
- The mentor can use the information to admire the learner that the learner uses the sentence opener and to encourage to keep continuing to do the deeper reflective thinking.

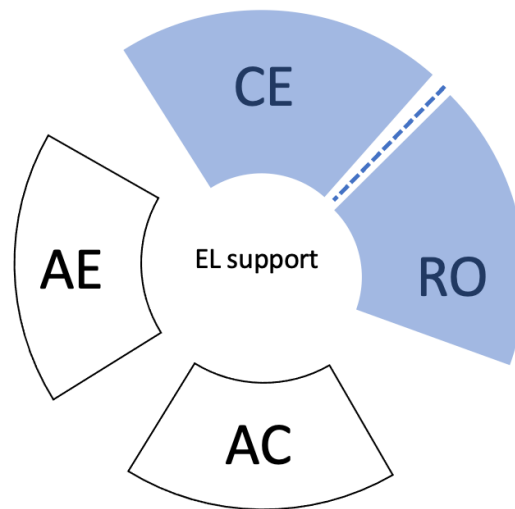


Figure 6.4 EL Learning stage of case study # 1 (CE-RO connecting)

(3) The learner starts to connect the past experience in week # 5 as the learner use the past experience in week # 4. Then, from week # 6 until week # 8, the learner connects the past experience from the previous and uses the sentence opener on the CE part to describe the connection of the past experience.

- The mentor can recognize that the learner is aware of Recursion concepts because the learner continuously uses the support tools to learn this concept.
- The mentor can use the information to admire the learner that the learner connects to the past experience to learn recursion concepts continuously.

(4) In week # 9, the mentor can observe that the learner stop using the sentence opener that describe the connection from the past experience but can connect the past experience to the present as AE in week # 8 is “I have a plan to ... diligent, persistent practice in coding and learn about Java in OOP in order to ... have further experience working in coding in order to write faster and more accurate” and CE in week # 9 is “Based on the experience about ... diligence and determination to practice making code.”.

- The mentor can observe that the learner develops the recursive learning behavior without using the sentence openers function.

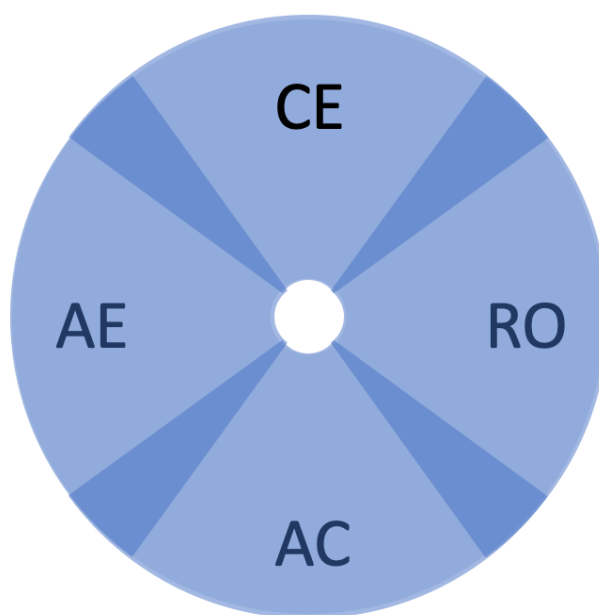


Figure 6.5 EL Learning stage of case study # 1 (EL integrating)

In the end, the learner does not use the sentence opener that mentioned the past experience but still does the deep thinking as CE: From my experience with ... GUI class making with the project came out ok RO: From the successful experience mentioned above. The reason for this success is because Me and my friends in the group have returned to study various algorithms. Regarding how to write GUI”.

- The mentor can interpret that the learner gains competency and the unconscious stage of learning that leads to an autonomous learning stage.
- The mentor can motivate the learner to continue this learning behavior to develop the autonomous learning of EL in the future.

Based on the learner’s interpretation, the learner has competency in EL since the LBP visualization shows that the learner progresses well by learning EL concepts step by step using the support system. The learner can integrate EL concepts well and gain the ability to become an autonomous learner of EL in the future. The quality of reflective writing is good, and the learner has a good self-assessment (MSS Pre-MSS Post - Pre: 2.90 -> Post: 3.97) as the mentor can observe the learner through LBP visualization.

Based on the analysis of this learner, the learner learns very well through the EL system. The analysis of the learning changes observed from the learning sensors and report writing and the use of learning functions in the system. The design of EL learning support functions helps this learner to gain EL concepts as well as the learner gain SRL and metacognitive behavior. The reflection report shows that the learner learned EL deep and integrated all the concepts, as observed from the description. The learner evaluates and reflects themselves very well as it is required metacognition to precisely assess themselves.

## 6.2 Case Study # 2 (2): The learner that may partially aware of EL concepts

### (Recursive Thinking)

In this section, the case study of a partially learned EL concepts is presented. We can observe that this learner evaluates on MSS-pre questionnaire as 2.97 but evaluate on MSS-post as 4.03 as table 6.8 shows data. This phenomenon contrasts with the quality of reflection writing reports. The learner realized the benefit of DL not based on learning; the learner does not know about EL at all, the learner tries to use SRL strategies on learning.

Table 6.8 data of case study # 2

<b>Data Sources</b>	<b>Variables</b>	<b>Values</b>
<b>Metacognitive Skill Scales (MSS)</b>	<b>Mean</b>	2.97
	<b>Standard Deviation</b>	0.49
	<b>MSS Factor 1</b>	3.00
	<b>MSS Factor 2</b>	2.85
	<b>MSS Factor 3</b>	3.11
	<b>Class Mean/ SD</b>	3.29/ 1.03
	<b>Class MSS Factor 1 Mean/ SD</b>	3.24/ 1.03
	<b>Class MSS Factor 2 Mean/ SD</b>	3.29/ 1.05
	<b>Class MSS Factor 3 Mean/ SD</b>	3.33/ 0.99
<b>Open-ended Questionnaire</b>	<b>Realization of the benefit of Distance learning to EL and SRL</b>	Gain patience

<b>EL Knowledge</b>	It is a good learning
<b>SRL Strategies</b>	Concentration, diligence, adapt to change, try to ask the teacher and try to learn, try to watch video repeatedly.
<b>Realization of the disadvantage of DL to EL and SRL</b>	To learn online is difficult to understand.

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The learner begins the report writing on week # 1, just like the other students that the learner attends the course orientation and the lecture of EL, its benefits, and how to use the system for weekly reflective writing as shown in table 6.9 and 6.10.

**In Week # 1**, the descriptions are generally short and shallow. The learner tells about what the learner learned during the class. The learner does not know about AC as what the learner write is not related to conceptualization [1]. The AE part is not well written, as is it not the plan or what to do next [2].

**In Week # 2**, the description in the AC part is improved and the AE part but still shallow. The learner seems to integrated CE, RO, and AC well as the description is related to "Class."

**In Week # 3**, the description patterns are repeated like the description from week # 2.

**In week # 4**, the description patterns are repeated as also observed in the following week.

**In week # 5**, the description patterns are repeated; each stage's content is almost the same but different in value.

During the first half, the learner shows no good reflective writing as the learner only uses the sentence that is easy for the learner to think and write it down. The repeated pattern can be observed here. The learner does not use any learning support functions; the learner does not read and reflect on the teacher's comment.



Table 6.9 The analysis of the learner on the report writing with time use in each process from tracking function (Week # 1 - 5) (case study # 2)

Week #	SPE	SO	CE Text	RO Text	AC Text	AE Text
1	-	-	I learned OOP	I still do not understand much about what I have learned	I learned many things about OOP [1]	I can do what teacher assigned [2]
Total 1:50 mins	-	-	0:07	0:09	0:11	0:09
2	-	-	I learn about "Class"	I can learn about "Class" not that much	I need to try to understand about "Class"	Try to understand for use in the exams and the future
Total 1:31 mins	-	-	0:05	0:12	1:00	0:09
3	-	-	I study about "Method" and "Constructor"	I do not understand as much as I choose	I need to try more	Use it in the homework and future
Total 1:44 mins	-	-	1:00	0:07	0:08	0:08
4	-	-	I study about "Inheritance"	I study about "Inheritance" and try to code but still error	I learned how to use the software and understand what I have learned but still not understand well	Use for homework and use in the future

Total 1:23 mins	-	-	0:15	0:12	0:26	0:07
5	-	-	I study about “Abstract and Interface Class”	I gain more understanding about it	I understand many things in the past	Work and extend in the future
Total 1:32 mins	-	-	0:24	0:27	0:08	0:05

As table 5.17, **In week # 6**, the learner starts to read a comment from the teacher, but the writing quality is still low. The learner only uses a short time to think and write.

**In week # 7**, the repeated writing pattern can be observed again. The time use in the AC part is more. The AE part is too broad.

**In Week # 8**, the learner is the first time use the connecting to the past planned experience. The learner chooses to connect what has a plan on week # 1: "Use for homework and use in the future." The learner takes 6 seconds to browse through the list of past plans and choose week # 1.

**In Week # 9**, the learner also connects the past planned experience from week # 1, but the thinking pattern is still the same.

There is no class in **Week # 10**, so the learner only writes what the fact is. The thinking is still shallow, and the quality of writing is terrible.

The learner does not show improvement because the learner does not use the system's learning support functions.

Table 6.10 The analysis of the learner on the report writing with time use in each process from tracking function (Week # 6 - 10) (A bad learner)

Week #	SPE	SO	CE Text	RO Text	AC Text	AE Text
6	-	-	Exam	Exam and I can do and cannot do	Tutoring before the exam	Try it next time
Total 0:39 mins	-	-	0:02	0:06	0:05	0:10
7	-	-	Study "Polymorphism"	I do not understand about it	I need to try more and review on the lesson	Use in the exam and future
Total 1:08 mins	-	-	0:17	0:11	0:21	0:06
8	Yes - Week #1	-	Try to study	Working on GUI but there are small errors	The basic on how to make GUI	Use in for homework and exam
Total 1:06 mins	0:06	-	0:09	0:09	0:05	0:05
9	Yes - Week #1	-	I learned how GUI works	Code is error but I understand the lesson	How to make GUI	Do the work and submit
Total 1:25	0:03	-	0:04	0:19	0:05	0:03

mins						
10	-	-	No class this week	I cannot do coding	Try to understand OOP	Use in the exam
Total 0:57 mins	-	-	0:06	0:13	0:04	0:04

The learning behavior patterns that can be captured are only when the learner starts to connect to the experience, as in figure 6.6.

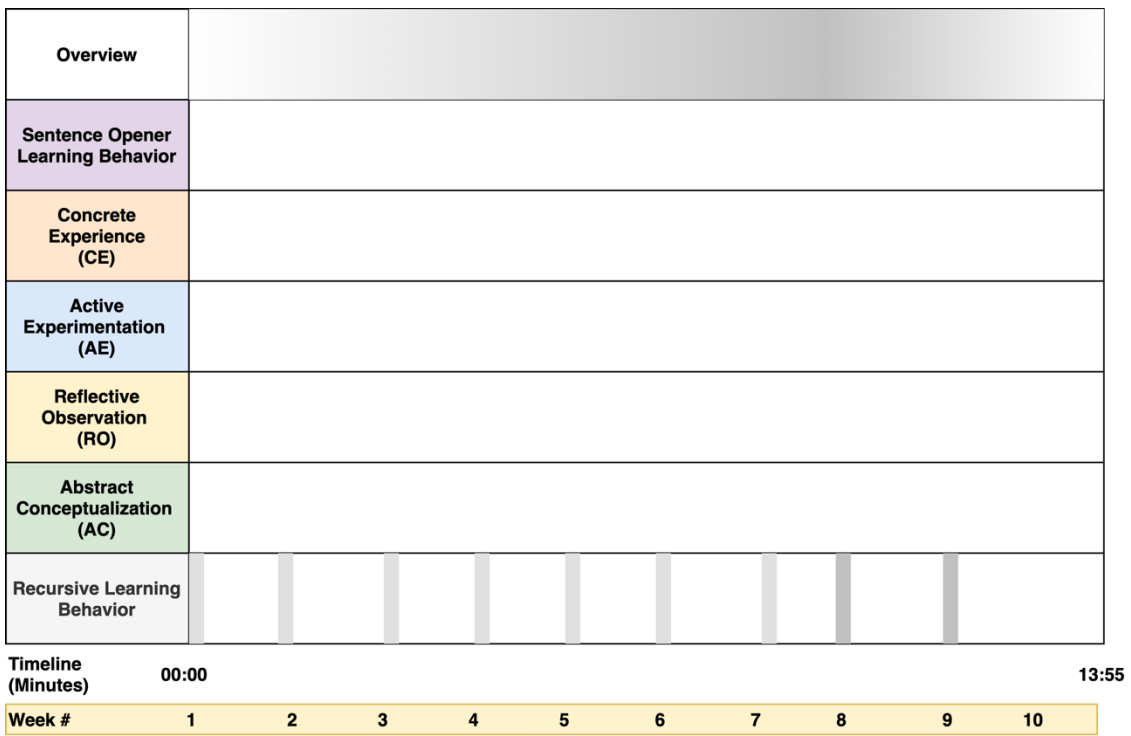


Figure 6.6 The thinking behavior that captured from the learning sensors (case study # 2)

Surprisingly, the learner evaluated MSS score higher than the average and a lot higher than before. This evidence implies that the MSS should not be the best way to use in evaluating the metacognition. As we can observe from the reflection, the learner cannot show metacognitive behavior at all as the data in Table 6.11.

Table 6.11 The comparison between pre-MSS score and post-MSS score (Case Study # 2)

<b>Data</b>	<b>Variables</b>	<b>Values - Before</b>	<b>Value - After</b>
<b>MSS</b>	<b>Mean</b>	2.97	4.03
	<b>Standard Deviation</b>	0.49	0.76
	<b>Mean of MSS Factor 1/SD</b>	3.00/ 0.53	4.38/ 0.75
	<b>Mean of MSS Factor 2/SD</b>	2.85/ 0.55	3.92/ 0.76
	<b>Mean of MSS Factor 3/SD</b>	3.11/ 0.35	3.89/ 0.78
	<b>Overall Class Mean/ SD</b>	3.29/ 1.03	3.98/ 0.89

For the mini-exam results, the learner answer is based on focusing on learning in a subject, not about learning EL concepts. For example, in the Q4 question asking about EL's most important concept, the learner answer about OOP subject related as in table 6.12.

Table 6.12 Mini Exam Results (Case study # 2)

<b>Variables</b>	<b>Values</b>
Q1 – EL Understanding	Well
Q2 – Usage of EL	Not well
Q2.1 – “Very Well, Good, Fair”	-
Q2.2 – “Fair, Not well, Not very well”	I do not understand because I am confused with many things. The old knowledge used in continuing to use is not very clear, so I do not understand in

	some parts; I am confused with many things. It's too difficult to understand in online learning.	
3. Reflect on Learning changes	Before	After
Attitude	I feel that it will be difficult	I somehow gain something
Behavior	Learn it in order to pass the exam	I try to understand so I can use in the future
Understanding	Have some knowledge but not considered as good	Understand and apply some
Ability	The basics are not very good	With some additional knowledge but not as much as expected
Q4 – Most Important Concept of EL	How to use the method for coding	
EL Definition (Before)	It is a good learning	
Q5 – EL Definition	try harder and harder and try to understand more and more so that we can improve ourselves.	

Moreover, in the reflection sheet of a learner in case study # 2 as in table 6.13, the learner reflects on understanding of EL and every concept of EL as very good. It contradicts the quality of report writing. The learner evaluates and reflects themselves not well as it is required metacognition to precisely assess themselves that is shown in MSS but not reflected well with the report writing quality.

Table 6.13 Reflection Sheet (case study # 2)

Variable	Value
Reflection on EL	Very good
Reflection on Realize of importance of EL	Very good
Reflection on learning CE concept	Very good
Reflection on learning RO concept	Very good
Reflection on learning AC concept	Very good
Reflection on learning AE concept	Very good
Reflection on learning Recursion concept	Very good
Realization of the usage of the functions provided in the system	The learner does not use any functions so the learner cannot realize the importance about them.

### 6.3 Case Study # 3 (5): Learner that has CE/ RO Dominant

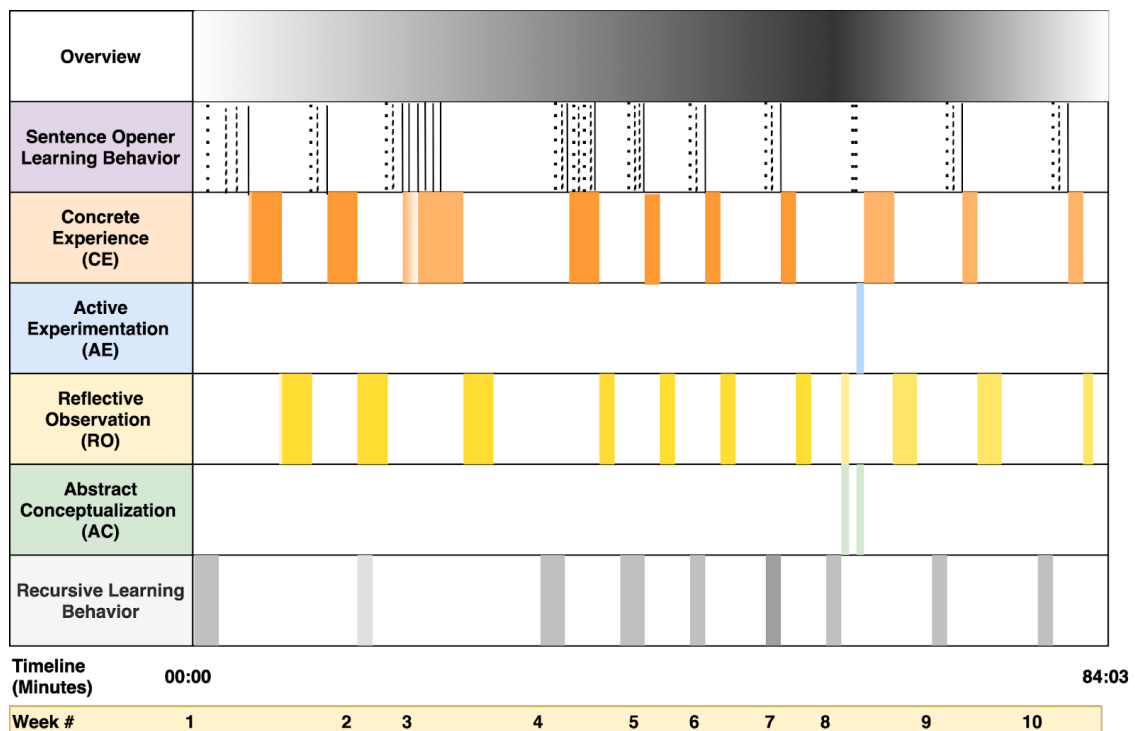


Figure 6.7 the thinking behavior captured from learning sensor (case study # 5)

This learner only learn CE, RO, and Recursive concepts without AC and AE concepts

- Lack of Abstract Conceptualization (AC): the learner did not learn to how to create the concept (abstract) from the experience

- Lack of Active Experimentation (AE): the learner did not learn to make a good plan and strategy to use what he/she learns in the future.

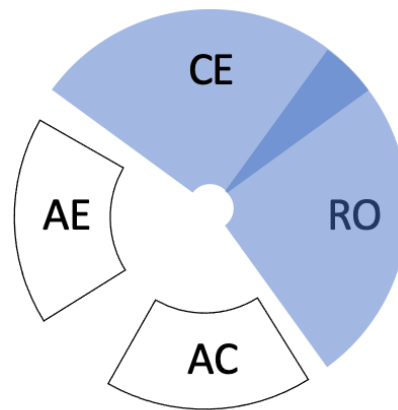


Figure 6.8 EL Learning stage of case study # 3 by the mentor interpretation of this learner

The mentor should admire that the learner learns Recursion, CE and RO very well but should promote and encourage AC and AE concepts by using the support functions provided.

Table 6.14 The example of Reflective Writing Data:

<p>CE: From experience with the program hang when there is a loop in the</p> <p>RO: From that experience, what has been accomplished is to fix the problem, not to freeze the program. I noticed that If the program is working too hard Therefore, it has to work in the background.</p> <p>AC: Has been learned about SwingWorker, which is a kind of Advanced GUI.</p> <p>AE: Find something that works similar to SwingWorker. But easy to use and more versatile.</p>
--

In the AC part description, the mentor realized that AC shows what he learned in the subject. Therefore, the mentor should show and encourage the AC to abstract what the learner learns from the experience, not from the subject. The learner evaluates himself (MSS Pre-MSS Post - Pre: 3.97 (High) - > Post: 4.5 (High)) high in both pre-post, the mentor should show the learner that the self-evaluation is inaccurate as the learner only learned CE, RO, Recursion concepts.



## 6.4 Teacher's Aspects

Before the course begins, we surveyed the faculty of Engineering and Technology of Panyapiwat Institute of Management (PIM) with 23 teachers. We use the open-ended question consist of six items (Appendix D). The goal of this questionnaire is to know the current distance teaching situation, difficulties, and strategies.

Based on the survey, 12 of them (52.2 %) do not agree that transforming the classroom lecture to distance learning is easy. To make the distance learning better, the teachers suggested how to motivate the learner is essential in this situation as the teacher and the learner cannot see each other face to face.

After finishing the course, based on the interview with the teacher who was involved as the mentor to use the system to give comments and feedback for the learners (Appendix I), the teacher described that for students to use this system, they can revise and self-thought on understanding and reaching the learning objective each week. Also, the learner learned the deficiency of one own then plans to improve themselves.

Because the teacher knows that the learners always copy each other's work, the teacher can observe through the reflection data and realize that they learned based on the course outline. The teacher uses the comment function and sees the progress and development of problem-solving skills of each student.

If there is no system like this, the teacher thinks that the learner tends to lose focus on revising and solving something that the student does not yet understand. By losing this focus, the learner will ignore and let the time pass by so the problem is not solved then it can cause failure in learning in this subject, and the problem cannot be observed for the teacher, so there is no data to improve the teaching method to let the learner understand more. If there is no information on how to use the system, EL concepts, and comments, it will not be easy.

## 6.5 Learners' Impression

We have thus far demonstrated the learner–mentor interactions in learning and the supported learning of EL to gain metacognitive thinking skills. We also survey learners' perspectives of learning in this environment using the following instruments:

- Open-ended questionnaire (pre) aims to survey learners' readiness for the learning situation, attitude toward distance learning, EL knowledge, and self-regulated learning-related behavior.
- Open-ended questionnaire (post) aims to survey learners' satisfaction with, impression of, and learning achievement with the learning environment.

In addition, to survey teachers' opinions of this learning environment, we use the following instruments:

- Open-ended questionnaire for teachers (pre) aims to survey the distance teaching situation and related difficulties and strategies for teachers.
- Open-ended questionnaire for teachers (post) aims to survey teachers' thoughts about the learning environment.
- An interview with teachers to survey their thoughts on using the learning environment to support EL.

Few learners understood the EL concepts when we surveyed them using the open-ended questionnaire (pre) before the learning environment started. Hence, we investigated how this environment functions to help learners learn EL concepts using the open-ended questionnaire (post). Most learners realized that the environment functions to support their EL learning. For example, learners can recognize their previous experience and ability to apply what they have learned in the future. One respondent, with reference to the recursive thinking reminder function, stated, "I can use past plans in the present and the future." To support how to think, self-question, and self-reflect, learners considered that the sentence opener function supported them. One said, "It is an appropriate selection of sample questions and answers for self-reflection." In case study # 1, the learner stated that the learning environment encouraged them to "set more goals for studying," adding "I have learned that mistakes are what we need to improve ourselves." Furthermore, the learner stated that "I have been using my ideas more creatively." Moreover, one learner mentioned that this learning environment is "a record of my thoughts."

We also observed how learners feel about their learning achievements. They realized their accomplishments based on EL, self-regulated learning, and their metacognitive skills, as shown by the following statements by learners: "I can change my attitude to learn more," "I cannot reflect on myself well, but I will try it in the future," "I see my strengths and weaknesses," "I can set goals," "I have become more enthusiastic about learning," and "I can make improvements and learn from past mistakes."

Based on the reflection sheet, the learners self-reflect on how they had changed their attitude, behavior, EL understanding, and EL ability. They realized how they had changed. For example, on the attitude toward EL, one learner said, "Learning new knowledge is complex" and wanted to "change the way of learning to make learning easier." One learner said that they "never review a lesson after learning" on EL thinking

behavior. However, the learner started to self-monitor “to review a lesson after class.” Most learners did not know the EL concepts or purpose. One learner said, "It makes me realize success and failure.” On EL’s ability, one learner said that they now “know how to think, analyze, and find solutions.”

In this section, post-analysis gives an overview of the learner after finish the course. The overall MSS score is higher than before, as in table 6.15. However, we cannot used this to evaluate the learner as we demonstrated contradiction in case studies.

Table 6.15 the overall of MSS score compare with pre- and post-analysis

Variables	Values - Before	Value - After
<b>Total Mean</b>	3.29	3.95
<b>Standard Deviation</b>	1.03	0.89
<b>Mean of MSS Factor 1/SD</b>	3.24/ 1.03	3.93/ 0.84
<b>Mean of MSS Factor 2/SD</b>	3.28/ 1.05	3.77/ 0.95
<b>Mean of MSS Factor 3/SD</b>	3.33/ 0.99	3.82/ 0.85

The reflection sheets data show that most learners learn EL knowledge well, realize the importance of EL well, know about CE well, know about RO well, know about AC moderate and AE moderate, know about recursion well.

Table 6.16 the reflection sheet

Variables	Category	Number (N=73)	Percentage
<b>Reflection on EL knowledge</b>	Very well	4	5.48
	Well	43	58.90
	Moderate	23	31.50
	Not well	3	4.11
	Not Very well	0	0
<b>Reflection on realization of the importance of EL</b>	Very well	4	5.48
	Well	43	58.90
	Moderate	23	31.50
	Not well	2	2.74
	Not Very well	1	1.37

<b>Reflection on CE</b>	Very well	5	6.85
	Well	39	53.42
	Moderate	26	35.62
	Not well	3	4.11
	Not Very well	0	0
<b>Reflection on RO</b>	Very well	7	9.59
	Well	36	49.32
	Moderate	29	39.73
	Not well	1	1.37
	Not Very well	0	0
<b>Reflection on AC</b>	Very well	5	6.94
	Well	26	36.11
	Moderate	39	54.17
	Not well	2	2.78
	Not Very well	0	0
	No answer	1	
<b>Reflection on AE</b>	Very well	8	11.11
	Well	29	40.28
	Moderate	33	45.83
	Not well	1	1.39
	Not Very well	1	1.39
	No answer	1	
<b>Reflection on Recursion</b>	Very well	6	8.22
	Well	33	45.21
	Moderate	33	45.21
	Not well	1	1.39
	Not Very well	0	0

## 6.6 Concluding Remarks

In this chapter, a learning environment to support learner to become aware of experiential learning (EL) skills is presented by case studies. We developed a web-based system that provides learning support functions for the learner and the teacher. The main feature is the experiential learning-based reflective writing function. The learner's report can be shared among the learner as well as the teacher

support function, which assists in giving comments and feedback to the learner. We propose e of a learning support system of the conceptualization of the educational concepts to support distance learning.

The case study of three different learners shows that a learner learned through the system using the learning support functions. From the analysis, an awareness learner learns step by step through the teacher's guidance and the trial-and-error process of using the system functions. A partially aware learner does not use any learning support functions. This learner only completes the report to get the score. A CE/RO dominant learner only view EL based on the concrete view of experience. The LBP visualization can be viewed as process/ progress; we can say that without LBP, the mentor does not know:

- The stages of learning (unconscious, aware)
- The how deep (Single phase, Connecting, Integration) of EL concepts (Recursion, CE, RO, AC, AE)

The Reflective Writing can be viewed as a result (output). The MSS can be viewed as a self-assessment. Most of the teacher/mentor assess based on the result, but LBP shows the process, then the teacher/mentor should assess based on the process of EL (EL is focus on process more than a product of learning). If the teacher uses MSS only, then case # 1 and case # 2 are the same so that the mentor/teacher cannot differentiate them. If the teacher uses MSS only in case # 3, then the mentor/teacher cannot praise the learner that does accurate self-assessment. The LBP shows how each learner progresses and how important suitable supports are needed.

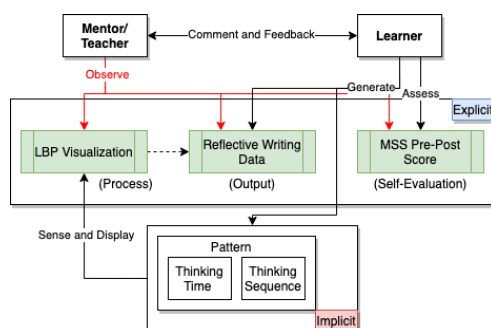


Figure 6.9 LBP, Reflective writing data and MSS score relationship

According to the case study results analysis, the learner initially exhibits a pattern of poor reflection, as we can see on his week # 1 reflective writing in CE part is "The first online learning experience in life. It was a little complicated, but I can pass for the first The teacher can use the information on LBP visualization to interpret the learner well, and the learner can improve the learning process to advance the learner's learning stage. As a result, the learning support functions help the learner to learn and promote reflective thinking. At the same time, the learning process and its observation are well-designed to support the mentor in interpreting the learner's learning status. We can conclude that we design the learning support function that can also capture the learning process well.

# Chapter 7

## Conclusions

In this chapter, the conclusions of the dissertation are discussions with the recommendation and limitations.

### 7.1 Discussion and conclusion

In this research, a learning model to improve experiential learning outcomes is presented. The research begins with the survey to understand the current internship program and its characteristics and problems. The main problem that we found in the first place based on the survey and interview with the learners is that the learner inactive to participate in writing the work record book (the Greenbook) because the learner does not realize the benefits of doing it and also the record structures are not based on cognitive theory.

The small group of the learner conducts the EL prototype system. The learner uses the EL-based question formatted and weekly report to write down the weekly report. In this stage of the research, the problem with verbalization is the main hypothesis that the learner is not good at verbalizing their learning. The results show that the learner develops SRL skills as well as EL skills. However, the change is not observed in the report because the learner learns implicitly but cannot externalize it. We then design the verbalize support function.

Next, the learning support functions are designed based on the verbalizing problem by using the sentence openers. The new user interface design allows the learner to connect the past experience that the learner planned to promote the learner's experiential learning recursiveness. The learning design and learning evaluation should do together. The learning sensors try to capture the learning behavior patterns that can be captured learning behaviors of the intended learning. The data analysis of the system using the qualitative and quantitative analysis and the data interpretation captured by the learning sensors show the learner development of EL skills. The skills and the development of SRL also change the attitude on how they learn.

## 7.1.1 Conclusion on Research Goals

### **SRG1: to support thinking by reflective writing support by provide hint, guide to write to promote thinking and enable learning observation**

To achieve this goal, the pilot study discussed in chapter 3 found a survey and interview of the learners, mentors, and faculties about the current internship situation and how well they know about EL. Based on the pilot study, we can externalize and conceptualize the learner's problems and difficulties in EL as:

**Learner:** the passive learners who do not actively participate in the internship experience do not use the greenbook (work record book) to write reflective writing. The writing quality is low, and most of them write it at the end of the internship to submit to get the grade.

The learner does not realize EL and reflective writing benefits, as there is no right way to teach EL concepts. The questions format in the greenbook has not followed cognitive theory. The lack of support from the mentor and teacher has a lack of EL knowledge. The mentor can give comments and feedback on work but not on EL.

**Mentor:** The mentor role is vital in internship or distance learning activity. As the prominent role is to motivate the learner to learn EL, most of the mentors only know how to motivate to work and only comment and feedback based on task, not on EL's learning. This because of the lack of EL support on the mentor side as well. The academic advisor teacher also does not realize the importance of giving comments and feedback to the learner.

**Evaluation of EL:** the challenging task in this work is how to evaluate the learner change in EL. EL is an implicit process that is difficult to observe, and we only observed the quality of reflective writing. The questionnaire and pre-posttest can be used as the evaluation tools, but it cannot tell how they develop their learning. The pilot study's findings in chapter 3 state that the learner learns EL very well, but implicitly they cannot externalize it.

**Verbalization:** The quality of reflective writing is low as no verbalization support helps the learner externalize EL concepts to present in the report writing. The learner cannot reflect deep, cannot connect from EL stage to stage, do not use the past plan into the next.

**SRG2:** to provide support for teachers or mentors as an observation interpretation of thinking behavior of the learner

**Mentor Support:** the mentor user interface design has the main function to observe the learner's reflective writing, the encourage and admire sentences function for motivating the learner to continue their good learning. The attributional feedback function gives the comment and feedback to point out where the learner needs to improve. The further development sentences function encourages the learner to use what they learned in the future that is to promote the recursion concepts to the learners. As well as the mentor guideline and knowledge about EL.

To achieve this goal, chapter 4 present the learning model to improve the EL process. Based on the problems and difficulties discussed in chapter 3, on how the learning goals are designed based on the problems found. The user interface for learners includes a support function. In chapter 5 discussed the analysis of using those functions to support EL learning.

**Learner Support:** the lecture program to give the lecture on EL knowledge, the benefits of practicing EL, how to use the web-based system were introduced to give the prior knowledge and motivate the learner. The learning goals are designed to improve EL's learning process, and the user interface design supports the learner to learn EL concepts on the reflective writing with the verbalize support functions.

The verbalization support functions include the sentence openers playing an important role in assisting the learner to learn keywords, sentence structure, and how to connect between each process of EL. The user interface design lets the learner use the past planned experience and extend the current experience.

**Evaluation:** techniques used for evaluating the learner's learning status is presented in chapter 5. The pre and post-test questionnaires were designed to examine the learner status. The learning sensors function is designed to detect the intended learning behavior that is designed parallelly with the learning goals to detect EL's implicit process. The evaluation framework is used to evaluate the designed learning function and learning environment.

## 7.2 Limitations

In this section, the limitations of this work are determined as follow:

### 7.2.1 The long-term analysis

First, the multi-phases internship activity is a long period that takes four years to complete. The first internship lasts for three months, followed by six months, followed by another nine-month program. Therefore, to study the whole internship period is not possible in this research. In this research, the shorter



period of 12-weeks internship and ten-week distance learning setting was used as the sample period to test the ideas. Further research is needed to investigate the more prolonged period effect of this learning model. The goal to do further research period is how the learner becomes autonomous in EL.

### **7.2.2 The group of learners**

In this research, the learners that were investigated are in the same faculty. To get better aspects of various groups of learners should be investigated. The effect of the language used in reflective writing and how it changes thinking should be investigated further.

## **7.3 Recommendations**

Although this study has developed a learning environment to improve EL learning outcomes, following recommendations can be generalized for improvement in future works.

### **7.3.1 The long-term research how to support EL to become**

#### **autonomous learner**

The longer period of the learner development of using the system that can lead the learner to become autonomous. To become autonomous learner, the learner should master all sub parts of a skill and are able to combine them to perform the whole sequence automatically with precision and are performed unconsciously. The skills can be used and apply in a variety of situations. Therefore, it takes several months or year to become autonomous. Besides, the study learner uses the reflective portfolio that has been done in the past phase and uses in the current phase.

Finally, the learning environment was employed for learning over a short length of time (a ten-week course). The acquisition of metacognitive abilities by learners cannot be completed in such a short period of time; these skills must be gained through everyday activities such as classroom learning, internships, and jobs. With this constraint, we must collect data by running this framework for an extended period of time in order to validate the sentence openers and assess the learning outcomes.

### **7.3.2 Development of Intelligent System**

To give a useful comment and feedback to promote EL to one learner is a challenging task as it needs to interpret the learner learning status and need to connect to the historical data. To support a massive number of learners is even more challenging. In this research, the data tracking functions track or the learning data from learners. Further research can use data mining or machine learning techniques to cluster good and bad learners and find a suitable method to support the learner. For example, the system

can learn that learner A is a bad learner from the learning behavior patterns captured by the learning sensors. Then they suggested the appropriate comment and feedback can be used to encourage the learner to learn.

In contrast, the learner can gain insight about their learning as well. The instant reflection in action can be used, such as a chat robot, to learn EL better or encourage to use the support function based on the learner interpretation.

A technique such as Natural Language Processing (NLP) can analyze factual text data from the learners' report to constructed the model on how to write better and more in-depth reflective writing.

### 7.3.3 Open Learner Model (OLM)

We developed the learning behavioral pattern (LBP) visualization function to represent the learner's experiential learning processes as a digestion of meta-level thinking activity used by a mentor or teacher. Future research will provide a more detailed analysis of the unintended learning behavioral patterns, which were prepared in advance. Furthermore, further research on the Open Learner Models (OLM) (Bull and Kay, 2010) can be beneficial in providing a representation of the learner as a necessary means of learning support to fully support the educational value of this learning environment. OLM aims to provide information about a learner's learning process that allows the learner to view information about himself/herself in order to promote learner reflection or monitor their learning. As a result, the visualization data in this study should be carefully evaluated before being used with learners.

The updated version of visualization shows trial and error events for example in figure 7.1 in week # 3, 4, 9 where the older version cannot be showed. This helps mentor to be able to correctly diagnose learner's status.

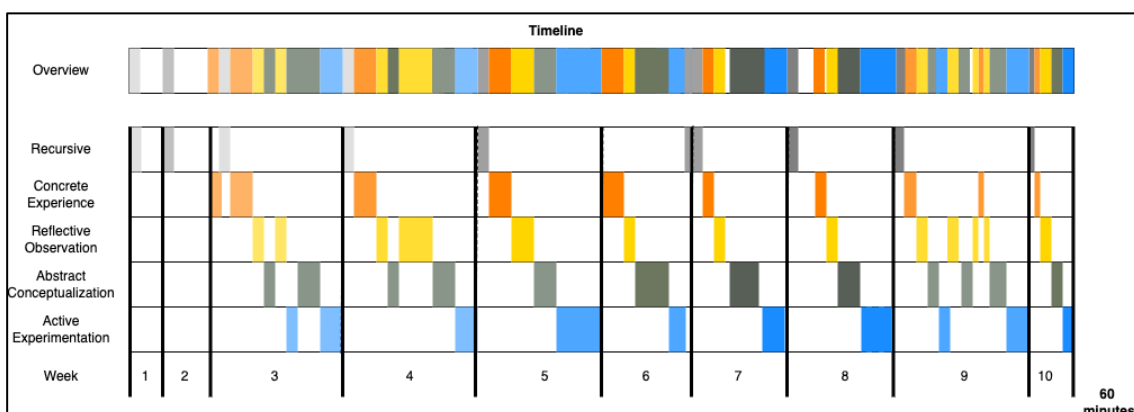


Figure 7.1 The updated version of visualization of case study # 1

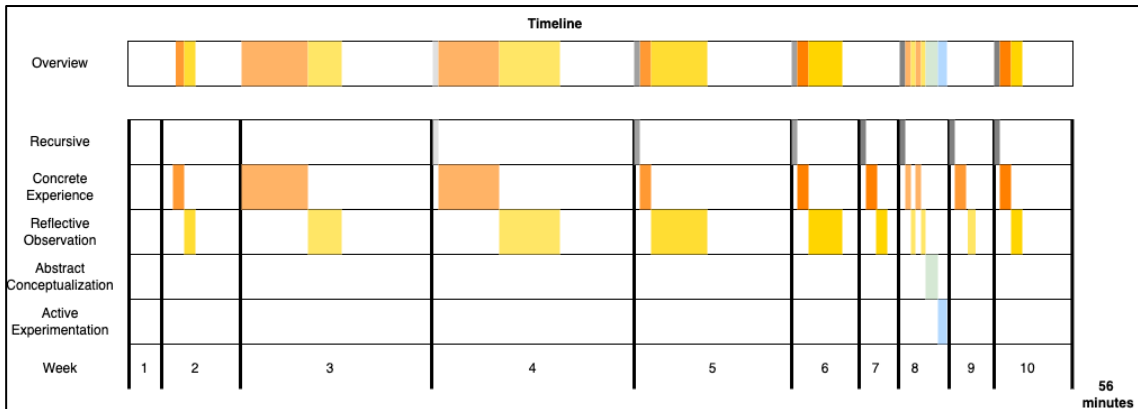


Figure 7.2 The updated version of visualization of case study # 2

### 7.3.4 Approach for evaluation

In this research, we tried to use some statistical analysis for example MSS-PRE and MSS-POST. However, we can see that the results from that analysis are contradicted with visualization and reflective writing data. We need to find good approach to evaluate the learner. One approach is to evaluate our visualization platform and to use as OLM.

We are now using this framework in various settings in university education (such as internships and distance learning) to validate sentence openers on the quality of language as teaching material and assess the learning results, and we want to examine the learning effect in the future. As a result, we want to examine this learning environment in Panyapiwat Institute of Management over an extended period of multiple-phased internships. This approach incorporates stakeholders such as diverse organizations with various work settings in various internship periods, as well as mentors' talents that assist experiential learning. These difficulties might create a good context for future study.

## 7.4 Contributions

### 7.4.1 Contribution to Knowledge Science

This framework is amplifying human intelligence that provide good communication between mentor and learner. This provides reflective support to promote metacognitive thinking. The enable of knowledge co-creation between learners-learners, learners-mentors by technology The dual roles of meta-level thinking support and observation of internal thinking process is presented. This research is contributing as one approach of experiential learning support.

## References

- Altindag, M., & Senemoglu, N. (2013). Metacognitive Skills Scale. *H. U. Journal of Education*, 28(28–1), 15–26.
- Alvi, E., Gillies M., R. (2020). Promoting self-regulated learning through experiential learning in the early years of school: a qualitative case study, *European Journal of Teacher Education*, DOI: 10.1080/02619768.2020.1728739
- Bland, A. J., Topping, A., & Tobbell, J. (2014). Time to unravel the conceptual confusion of authenticity and fidelity and their contribution to learning within simulation-based nurse education. A discussion paper. *Nurse Education Today*, 34(7), 1112–1118. <https://doi.org/10.1016/j.nedt.2014.03.009>
- Bloom, M. (2013). Self-regulated learning: Goal setting and self-monitoring. *The Language Teacher*, 37(4), 46–51.
- Bull S., Kay J. (2010) Open Learner Models. In: Nkambou R., Bourdeau J., Mizoguchi R. (eds) *Advances in Intelligent Tutoring Systems. Studies in Computational Intelligence*, vol 308. Springer, Berlin, Heidelberg. [https://doi.org/10.1007/978-3-642-14363-2\\_15](https://doi.org/10.1007/978-3-642-14363-2_15)
- Butler, D. L., & Winne, P. H. (1995). Feedback and Self-Regulated Learning: A Theoretical Synthesis. *Review of Educational Research*, 65(3), 245–281. <https://doi.org/10.3102/00346543065003245>
- ChanLin, L.-J., & Hung, W.-H. (2015). Evaluation of An Online Internship Journal System for Interns. *Procedia - Social and Behavioral Sciences*, 191, 1024–1027. <https://doi.org/10.1016/j.sbspro.2015.04.700>
- Chen, W., Fujii, M., Cui, L., Ikeda, M., Seta, K., & Matsuda, N. (2011). Sizhi: Self-dialogue training through reflective case-writing for medical service education. *Proceedings of the 19th International Conference on Computers in Education, ICCE 2011, (November)*, 551–558.
- Curtiss, P. R., & Warren, P. W. (1973). *The dynamics of life skills coaching*. Prince Albert, Sask: Training Research and Development Station, Dept. of Manpower and Immigration.
- Dressler, J. A., Ryder, B. A., Connolly, M., Blais, M. D., Miner, T. J., & Harrington, D. T. (2018). "Tweet"-Format Writing Is an Effective Tool for Medical Student Reflection. *Journal of Surgical Education*, 1–5. <https://doi.org/10.1016/j.jsurg.2018.03.002>

- Duangnamol, T., Supnithi, T., Srijuntongsiri, G., & Ikeda, M. (2018). Computer-Supported Meta-reflective Learning Model via mathematical word problem learning for training metacognition, 1–29.
- Farahian M, Avarzamani F, Rajabi Y, Reflective thinking in an EFLWriting Course: To what level do portfolios improve reflection in writing?, *Thinking Skills and Creativity*(2020), doi:<https://doi.org/10.1016/j.tsc.2020.100759>
- Flavell, H. J. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, 34(10), 906–911. <https://doi.org/10.1002/bit.23191>
- Gage, N.L. & Berliner, D.C. (1984). *Educational psychology*. Boston: Houghton Mifflin Company.
- Gagne, R. M. (1968). Learning hierarchies. *Educational Psychologist*, 6, 63–84. Retrieved from [http://ibstpi.org/\\_dev/archived/backup/Products/pdf/](http://ibstpi.org/_dev/archived/backup/Products/pdf/)
- Hall, C.W. (2001). A measure of executive processing skills in college students. *College Student Journal*, 35(3), 442-450.
- Kennedy, L. W., Akers, C., & Jackson, R. B. (2017). Using an Experiential Learning Design to Teach Photography in Agricultural Communications Using an Experiential Learning Design to Teach Photography in, 101(4).
- Kingkaew, C., Supnithi, T., Theeramunkong, T., Morita, K., Tanaka, K., & Ikeda, M. (2019). A Learning Model to Improve Outcome on Experiential Learning in A Multi-phase Internship: A Case Study of The Internship Program of a Thai University. In 8th International Congress on Advanced Applied Informatics (pp. 209–214). Toyama, Japan. <https://doi.org/10.1109/IIAI-AAI.2019.00049>
- Kolb, A. Y., & Kolb, D. A. (2005). Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Academy of Management Learning & Education*, 4(2), 193–212. <https://doi.org/10.31219/osf.io/rdq97>
- Kolb, D. A. (1984). *Experiential Learning: Experience as The Source of Learning and Development*. Prentice Hall, Inc., (1984), 20–38. <https://doi.org/10.1016/B978-0-7506-7223-8.50017-4>
- Mathew, I. R., & Iloanya, E. J. (2016). Open and Distance Learning: Benefits and Challenges of Technology Usage for Online Teaching and Learning in Africa. *Pan-Commonwealth Forum 8 (PCF8)*. Retrieved from <http://oasis.col.org/bitstream/handle/11599/2543/PDF?sequence=4>

- Morisano, D., Hirsh, J. B., Peterson, J. B., Pihl, R. O., & Shore, B. M. (2010). Setting, Elaborating, and Reflecting on Personal Goals Improves Academic Performance. *Journal of Applied Psychology*, 95(2), 255–264. <https://doi.org/10.1037/a0018478>
- Morita, K., Tanaka, K., Kingkaew, C., & Ikeda, M. (2019). A Learning Environment Attracting Attention to the Nested Structure of Metacognition of Self-Regulated Learning. In 2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI) (Vol. 54, pp. 203–208). Toyama, Japan: IEEE. <https://doi.org/10.1109/IIAI-AAI.2019.00048>
- Musingafi, M. C. C., Mapuranga, B., Chiwanza, K., & Zebron, S. (2015). Challenges for open and distance learning (ODL) students: Experiences from students of the Zimbabwe Open University. *Journal of Education and Practice*, 6(18), 59–66.
- Pamungkas, S. F., Widiastuti, I., & Suharno. (2020). 21st century learning: Experiential learning to enhance critical thinking in vocational education. *Universal Journal of Educational Research*, 8(4), 1345–1355. <https://doi.org/10.13189/ujer.2020.080427>
- Schunk, D. H. (1983). Goal difficulty and attainment information: Effects on children's achievement behaviours. *Human Learning: Journal of Practical Research & Applications*, 2(2), 107–117.
- Tanaka, K., Ikeda, M., Mizushima, K., & Nakabayashi, K. (2017). Learning how to learn with knowledge building process through experiences in new employee training: a case study on learner-mentor interaction model. *International Journal of Knowledge and Web Intelligence*, 6(1), 20–34. Retrieved from <https://doi.org/10.1504/IJKWI.2017.086143>
- Weiner, B. (1992). *Human motivation: Metaphors, theories, and research*. Newbury Park, CA: SAGE Publications.
- Wessel, J., & Larin, H. (2006). Change in reflections of physiotherapy students over time in clinical placements. *Learning in Health and Social Care*. <https://doi.org/10.1111/j.1473-6861.2006.00124.x>
- Woolf, B. P. (2010). Student modeling. In *Studies in Computational Intelligence* (Vol. 308, Issue September 2010). [https://doi.org/10.1007/978-3-642-14363-2\\_13](https://doi.org/10.1007/978-3-642-14363-2_13)
- Zimmerman, B. J., & Schunk, D. H. (2001). *Self-regulated learning and academic achievement: Theoretical perspectives*. Mahwah, N.J: Lawrence Erlbaum Associates Publishers.

## Publication Lists

[1] **Chanakarn KINGKAEW**, Thanaruk THEERAMUNKONG, Thepchai SUPNITHI, Pornsiri CHATPREECHA, Kai MORITA, Koji TANAKA & Mitsuru IKEDA (2023), A learning environment to promote awareness of experiential learning process with reflective writing support, in MDPI Education Sciences (Peer-reviewed journal)

[2] **Chanakarn KINGKAEW**, Thepchai SUPNITHI, Thanaruk THEERAMUNKONG, Pornsiri CHATPREECHA, Kai MORITA, Koji TANAKA & Mitsuru IKEDA (2019). A Learning Model To Improve Outcome On Experiential Learning In A Multi-phase Internship: A Case Study Of The Internship Program Of A Thai University. 8th International Congress on Advanced Applied Informatics, 209–214. <https://doi.org/10.1109/IIAI-AAI.2019.00049>. Accepted in 8th International Congress on Advanced Applied Informatics, 2019, pp. 209–214. Date of presentation: 12 July 2019, Venue: Toyama International Conference Center Otemachi forum, Toyama, Japan.

[3] Kai MORITA, Koji TANAKA, **Chanakarn KINGKAEW** & Mitsuru IKEDA (2019). A Learning Environment Attracting Attention to the Nested Structure of Metacognition of Self-Regulated Learning. 2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI), 54, 203–208. <https://doi.org/10.1109/IIAI-AAI.2019.00048>. Accepted in 8th International Congress on Advanced Applied Informatics, 2019, pp. 209–214. Date of presentation: 12 July 2019, Venue: Toyama International Conference Center Otemachi forum, Toyama, Japan.

**Appendix A: The Open-Ended Questionnaire (Pre) for the Pilot Study**

<b>Number</b>	<b>Question</b>	<b>About Who</b>	<b>About What</b>
<b>Q1</b>	How do you feel about the current internship activities? (Direction: overall A, B)	<b>Learner</b>	<ul style="list-style-type: none"> <li>• The overall situation of student A,B</li> <li>• <b>Experiential Learning</b></li> </ul>
<b>Q2</b>	What are the problems you are facing during this internship? (Direction: deep understanding about A, B)	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Experiential Learning</b></li> </ul>
<b>Q3</b>	How do you use the workbook record (Greenbook)? (Direction: to see if learners do self-reflection)	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Self-Reflection</b></li> <li>• <b>SRL</b></li> </ul>
<b>Q4</b>	In the past x months, how many times did you record your internship experiences on the green book? and Why?	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Self-Reflection</b></li> <li>• <b>Experiential Learning</b></li> <li>• <b>SRL</b></li> </ul>
<b>Q5</b>	How is the workbook record (Greenbook) improve your internship experience?	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Experiential Learning</b></li> </ul>
<b>Q6</b>	How often is the best for your learning to record your internship experiences?	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Self-reflection</b></li> <li>• <b>SRL</b></li> </ul>
<b>Q6-1</b>	Please provide the reason why? (If Q4 and Q6 do not match)	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Self-reflection</b></li> <li>• <b>SRL</b></li> </ul>
<b>Q7</b>	How do you feel about the meaning of internship activities?	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Experiential Learning</b></li> </ul>



<b>Q8</b>	How do you feel about the meaning of the green book (work-record)?	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Self-Reflection</b></li> <li>• <b>Experiential Learning</b></li> <li>• <b>SRL</b></li> </ul>
<b>Q9</b>	How do you feel about your mentor in Daily Mentoring? (Reflection in action)	<b>Mentor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-in-action</b></li> </ul>
<b>Q10</b>	What is the meaning of daily mentoring (Reflection in action)	<b>Mentor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-in-action</b></li> </ul>
<b>Q11</b>	How do you feel about your mentor comment in Greenbook? (Reflection on action)	<b>Mentor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-on-action</b></li> </ul>
<b>Q12</b>	What is the meaning of mentor comment in the greenbook? (Reflection on action)	<b>Mentor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-on-action</b></li> </ul>
<b>Q13</b>	How do you feel about your academic advisor comment in Greenbook? (Reflection by AA)	<b>Academic Advisor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-on-action</b></li> </ul>
<b>Q14</b>	What is the meaning of academic advisor comment in greenbook ? (Reflection by AA)	<b>Academic Advisor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-on-action</b></li> </ul>
<b>Q15</b>	If your mentor does not write any comment (reflection-on-action) on the greenbook, then did your mentor use another way for example: talk directly, meeting or something else to talk about your description on the green book? And which way? What's the meaning of the comment?	<b>Mentor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-on-action</b></li> </ul>

<b>Q16</b>	If your academic advisor does not write any comment (reflection-on-action) on the greenbook, then did your academic advisor use another way for example: talk directly, meeting or something else to talk about your description on the green book? And which way? What's the meaning of the comment?	<b>Academic Advisor</b>	<ul style="list-style-type: none"> <li>• <b>Reflection-on-action</b></li> <li>• <b>Greenbook</b></li> </ul>
<b>Q17</b>	Do you want to re-read the submitted greenbook (Phase 1 and/or 2 greenbook) ? (Reason to provide portfolio in the system)	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Greenbook</b></li> <li>• <b>Multi-phase Internship</b></li> </ul>
<b>Q18</b>	The period that you finish Phase II to the start of Phase III of internship, during that time how do you prepare for the next phase (III) of Internship?	<b>Learner</b>	<ul style="list-style-type: none"> <li>• <b>Multi-phase Internship</b></li> <li>• <b>EL</b></li> <li>• <b>SRL</b></li> </ul>

**Appendix B: The Semi-Structure Interview**

<b>Q#</b>	<b>Questions</b>	<b>Related Goal</b>
<b>QJ1</b>	How the guideline helps your learning in the internship?	LG-GL
<b>QJ1-1</b> - <b>QJ1-6</b>	Do well do you understand the following words in guideline? (scale -2 to 2) - Reflective writing - Concrete Experience - Reflective Observation - Abstract Conceptualization - Active Experimentation - Experiential Learning	
<b>QJ2</b>	How the web-EL system help you learn through weekly reflective writing?	LG-WEL, SLG-GL3
<b>QJ2-1</b>	How the web-EL system help you to describe your experience for reflection?	LG-WEL, SLG-WEL1, LG-GL, SLG-GL1, SLG-GL3, SLG-GL4
<b>QJ2-2</b>	How the web-EL system help you to reflect on your success and failure experience?	LG-WEL, SLG-WEL2 LG-GL, SLG-GL1, SLG-GL3, SLG-GL4
<b>QJ2-2-S1</b>	How do you feel about this system compare to the greenbook?	LG-WEL
<b>QJ2-3</b>	How the web-EL system helps you to think/consider conceptualizing the experience?	LG-WEL, SLG-WEL3 LG-GL, SLG-GL1,

		SLG-GL3, SLG-GL4
<b>QJ2-4</b>	How the web-EL system helps you to be able to apply what you learn in the <u>next trial/chance</u> ? (AE)	LG-WEL, SLG-WEL4 LG-GL, SLG-GL1, SLG-GL3, SLG-GL4
<b>QJ2-5</b>	How do you use the mentor comments on the system to improve your learning? (sub-question if “No” answer before)	LG-WEL, SLG-WEL5 LG-GL, SLG-GL1, SLG-GL3, SLG-GL4
<b>QJ3</b>	How does the system help to regulate your experiential learning?	LG-GL, SLG-GL2

**Appendix C: Open-Ended Questionnaire (Pre) on Experiential Learning (EL) in the Distance Learning**

Question Number	Question Items
1	Can you give the opinion about what are the benefits of distance learning?
2	During distance learning, what are the most concerns/problems that you are facing on your learning in the subject?
3	How do you think you can make your own learning better during this situation?
4	What do you think the way to improve learning in distance learning better? Please share your opinion.
5	Please describe your understanding of experiential learning.
6	Before studying in the subject this semester, what do you do for learning?
7	While learning the subject, if the learning goal could not be accomplished, what do you usually do?
8	During learning in the subject, what strategy do you usually do?
9	In this situation, after you are studying in the subject each week, what do you usually do?
10	Please describe your opinion on the challenge and disadvantage of distance learning in the situation compare to classroom learning.

**Appendix D: Teacher's Questionnaire (Pre)**

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**Question Number Questions**

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Do you think your lecture in the classroom is easy to transform to the distance  
1 learning? (YES/NO)

1.1 Yes – Why do you answer as above please provide the reason?

1.2 No – What is the expected problems? Please explain.

What is your opinion on the benefits of the distance learning in this situation  
2 compare to the classroom lecture on the learning activity?

What is your opinion on the most challenge of the distance learning in this  
3 situation compare to the classroom lecture?

4 What is the method do you use to teach during this situation?

Based on the teaching method on (4) what do you think are advantages and  
5 disadvantages? Please provide your opinion.

6 What is your opinion on how can improve the teaching in this situation?

**Appendix E: Reflection sheet on Experiential Learning**

**Reflection on Experiential Learning**

**Instruction:** During this distance learning (DL) period which caused by COVID-19, to support your learning in OOP subject. We provide you a learning environment where you can learn the experiential learning concepts through your learning experience by using the web-based system to do weekly report based on your experience. Therefore, in this part, please reflect on what experiential learning (EL) concepts you have learned through this learning activity.

1. How well do you learn Experiential Learning (EL) with distance learning?

Very Well      Good      Fair      Poor      Not Very  
Well

2. From Question #1, Please explain what do you have learned by this activity?

3. How well do you realize the importance of EL?

Very Well      Good      Fair      Poor      Not Very  
Well

4. From Question # 3, please explain what is the importance that do you realize?

5. How well do you learn the following concepts by this activity?

**Concepts**

<b>Concrete Experience (CE)</b>	Very Well	Good	Fair	Poor	Not Very Well
<b>Reflective Observation (RO)</b>	Very Well	Good	Fair	Poor	Not Very Well
<b>Abstract Conceptualization (AC)</b>	Very Well	Good	Fair	Poor	Not Very Well

<b>Active Experimentation (AE)</b>	Very Well	Good	Fair	Poor	Not Very Well
<b>Recursion</b>	Very Well	Good	Fair	Poor	Not Very Well

6. Please explain what you do have learned of each concept during this activity

During a week, you have to study in the class and then you will need to reflect on your learning using the web-based system. You are asking to reflect your experience based on four questions that follow EL cycle.

<b>Concepts</b>	<b>What do you have learned?</b>	<b>What is unclear or confusing?</b>
<b>Concrete Experience (CE)</b>		
<b>Reflective Observation (RO)</b>		
<b>Abstract Conceptualization (AC)</b>		
<b>Active Experimentation (AE)</b>		
<b>Recursion</b>		

**Appendix F: The Open-Ended Questionnaire for the learner**

**The Open-Ended Questionnaire for**

**The Learner**

During this distance learning (DL) period which caused by COVID-19, to support your learning in OOP subject. We provide you a learning environment where you can learn from the experience by using the web-based system to do weekly report based on your experience. There are many functions to support your learning such as Hint, Feed, Sentence Opener and more. After you finish your report in the end of the week, the teacher gives you a comment and feedback to you. Therefore, in this questionnaire, **please provide your learning aspects and feedbacks based on this learning environment.**

1. How well do the guideline/ the hint function helps you learn EL with Distance learning?

Very Well      Good      Fair      Poor      Not Very Well

2. How well do the feed function helps you learn EL with Distance learning?

Very Well      Good      Fair      Poor      Not Very Well

3. How well do the sentence opener function helps you learn EL concepts?

Very Well      Good      Fair      Poor      Not Very Well

4. Please explain the reason why you select that choice on question #3?

5. In each week, the past plan that you specified may used in the following week by select past plan function. Please explain the importance of using the past AE function to connect the past experience and to the present?



6. In each week, once you finished the report the teacher will give you a comment. From that comment and feedback, please describe the importance of using the teacher comment from the system to improve your learning.

7. Which learning functions in this learning environment helps you to understand EL concepts? Please choose the three most appropriate choices that you learned through this learning environment. (Yes – continue and 7.1/ No – go to 7.2)

(Please rank 3 most important)

- The lecture in about EL in the beginning of the class helps me understand EL concepts
- The hint/ knowledge function in the system helps me understand EL concepts
- I learn the vocabulary from the sentence opener function, it helps me understand EL concepts deeper
- I learn the sentence to describe my learning in EL from the sentence opener function
- I realized the connection between EL concepts through the input/output of the concepts function
- By do the weekly report in each week, it helps me understand EL concepts steps by steps.
- I learn how to use the connection of past experience and extend into the present.
- I learn on how to reflect on the teacher comment and change my learning
- I observed the other learners and I try to learn from their report writing as a good example via Feed function
- Other: \_\_\_\_\_

- 7.1 Please state the reason why do you think to choose the above choice in (7)?

- 7.2 Please provide the reason why do you said 'No'?

8. Which learning activities help you to regulate your experiential learning?

Please choose the three most appropriate choices that help you regulate through EL cycle by this learning environment. (Yes – continue and 8.1/ No – go to 8.2)

(Please rank 3 most important)

- It helps me to use my previous experiences while organizing my new learnings (Recursion)
- It helps me to carefully think of the experience that is make me learn (CE)
- It helps me to realize the connection of the past experience into the present (CE, Recursion)
- It helps me to realize the importance of self-reflection on my experience (RO)

- It helps me to reflect on my experience with the reasons and aspects why I succeed or failed (RO)
- It helps me to use my thinking to think of the concept that I learned from the experience (AC)
- It helps make plan so that I can try to do something to improve my learning and use it in the next chance (AE)

It helps make plan so that I can try to do something to continue my learning and use it in the next chance (AE)

- Other: \_\_\_\_\_

8.1 Please state the reason why do you think to choose the above choice in (8)?

8.2 Please provide the reason why do you said 'No'?

9. Please specify on changed that you observed by this learning environment.

Please choose the three most appropriate choices that you changed through this learning environment.

(Yes – continue and 9.1/ No – go to 9.2)

(Please rank 3 most important)

- I improved attitudes toward learning to focus more of my learning experience (CE)
- Before I study, I revised the lesson in order to improve my learning outcomes (AE, CE)
- I think that mistake is one of important aspect of my learning growth (RO)
- I carefully think about to observe my learning more and more (RO)
- I observed my learning in the aspects of success and fail experience more (RO)
- I realized that my learning needs to be improved so I make a plan and try to improve it (RO, AE)
- I always think what I should do before starting next class (AE)
- I always ask myself what and why I cannot learn well and try to seek for a solution (RO)
- I think deep to create the concept, so I learn how to think better (AC)
- I plan my class before it starts, so my learning outcome is improved.
- I apply the knowledge learned from the experience into a similar situation.
- I think of using of feedback to improve my learning
- I develop reflective practice such that I do self-monitoring on my plan, my learning outcome
- I realize that I can improve, and I know how I can improve.

- I practice more on [coding] because I realize my mistake and that cannot be done only by reading a text.
- I gain critical thinking as I think on my learning carefully
- Other: \_\_\_\_\_

9.1 Please state the reason why do you think to choose the above choice in (9)?

9.2 Please provide the reason why do you said 'No'?

10. Please share your opinion on what do you think about by learning through this learning environment helps you to develop your future career.

11. During this Distance Learning period, what are the problems in the beginning that you face and that can be overcome by this learning environment? Please rank 3 most suitable aspect.

- Understanding and Knowledge gain (I feel difficult to learn and cannot follow my colleagues)
- Learning Environment and Experience (Learn at home is not like learn in the university)
- Motivation to learn (Lack of willingness to learn)
- Concentration, Self-Regulation (Lack of concentration)
- Communication between teacher and learner (I cannot gain support from teacher)
- Communication between learner and learner (Learning at the same pace with my friend)
- Isolation and socialization (Lack of socialization, cannot fully cooperate)
- Other: \_\_\_\_\_

11.1 Please provide the reason why you rank the choice in (11)?

1.

2.

3.

12. (Optional) Any comment and feedback on the system? Please provided feedbacks the aspects of:

- The User Interface designs
- The speed
- Ease of use and more

Appendix G: Experiential Learning Mini Exam

Experiential Learning Mini Test

Part 1: Self-Assessment

1. Please carefully assess your understanding of Experiential Learning Concepts by yourself and select the appropriate choice that is fit for you based on your Experiential Learning (EL) experience during 10-weeks of the distance learning period.

Very Well      Good      Fair      Poor      Not Very Well

2. Please carefully assess you're the usage of EL concepts in your Weekly Report yourself and select the appropriate choice that is fit for you based on your Experiential Learning (EL) experience during 10-weeks of the distance learning period.

Very Well      Good      Fair      Poor      Not Very Well

2.1 If your evaluation is “very well”, “good” or “fair”,– please demonstrate why you evaluate by demonstrating in which situation you can use EL concepts appropriately and in which case that you find it is challenging to use to complete the weekly report.

2.2 If your evaluation is “fair”, “Poor”, “Not very well” , please demonstrate why you evaluate so by demonstrating in which situation you cannot use EL concepts appropriately and in which case that you find it is challenging to use to complete the weekly report.–

3. Please reflect on your learning changes on understanding/ability of EL by comparing the changes before and after using this framework for 10-weeks and then please describe the aspect of changes that you gain.

The aspect that you can describe for example:

- **Learning attitude** (Example: I have a no attitude toward self-reflection of failure for example before I did not carefully think about why I cannot use "if-statement" and do trial and errors because I feel bad to look at failure side of my selves / but now I have an attitude toward self-reflection of failure after I try to learn what I should do when I faced difficulty when I cannot do programming tasks I try to investigate the cause and try to improve it because it makes me better understand of my selves that I learn from Reflective Observation (RO))
- **Behavior change** (Example: I never plan a learning strategy before for example I never try to plan to improve lack of programming skill to write the "constructor" before I start next class/ but now, I plan a learning strategy to improve my programming skills carefully with goals to understand about "constructor" concept better with trial and error so in next chance I can apply programming skills that I learn from Active Experimentation (AE) concept)
- **EL concepts understanding** (Example: I do not realize CE concepts before as I never carefully focus on my significant experience / but now I understand how to carefully select the experience that make me learn for example the experience that I has a chance to write the graphics user interfaces (GUI) without helping tools, this experience is make me learn after I try to reflect, analyze such the experience make understand more of my learning that I learn from Concrete Experience (CE))
- **EL ability** (Example: I have never to use my analytical skill to think about the concept I learned from programming experience such as in order to learn better / but now I use my analytical skill to think about that I learn from Abstract Conceptualization (AC))

	Before	After
Learning Attitude		
Behavior Change		
EL concepts understanding		
EL Ability		

**Part-2: EL Understanding**

4. Please share your opinion on what do you think is the most important concept for you and why?

5. Please define the Experiential Learning (EL) concepts based on EL cycle from what you learned from this framework using your own words.

## Appendix H: The Metacognitive Skill Scales (MSS)

**Reference:** (Altindag & Senemoglu, 2013).

Question Items	1 Not Very Well	2 Not Well	3 Moderate	4 Well	5 Very Well
03. I use my previous experiences while organizing my new learnings					
04. It is important for me to overview my learnings from time to time to determine how much and what I learned					
07. I plan how and when to use the resources that will help me learn a subject well					
08. I recognize my errors during learning process					
10. If the learning couldn't be accomplished I search for other strategies that could be effective					
11. I don't have an exact idea of how to organize my learning					
12. While learning a subject, I am not aware of employing which strategy and how to use it					
18. I know how much time I need to learn a subject					
19. I revise my study plan that I used in learning and make necessary corrections					
20. I check if I understood a subject during learning					
24. When learning strategy that I used fails in learning process, I employ new one					
26. I have difficulty in understanding the reason of the trouble I experienced during learning					
28. I have difficulty in planning my learning a subject in accordance with my own learning qualities					
29. I check if I effectively use my time during learning					



30. I have difficulty in distinguishing important parts about a text or a learning unit					
32. I search for the reasons of the failure while learning a subject					
33. It is important for me to build meaningful relations between learned subjects during learning					
34. I search for how I learned a subject most effectively while learning					
35. I prepare the learning environment that is necessary for learning process					
36. I critically make a plan before beginning to study a text					
37. I revise and correct the learning strategies while studying a subject					
38. I assess if the cognitive strategy that I employ has been successful or not					
39. Till I reach a result, I organize the conditions for keeping my attention					
41. I know which subjects I can learn easily and which I will have difficulty in learning					
42. I don't spare much time for monitoring how much I learned about the subject during learning process					
47. I know the other subject matters that I can use an effective learning strategy in a subject					
50. I determine which learning strategy I should employ before I start studying					
53. I know when I need to ask for help					
54. During learning process, I have difficulty to determine in which conditions I can learn and those I have failed to learn					
55. I determine what I will learn about a subject before I start studying it					

### Appendix I: Interview with the teacher (Post)

Question #	Question Items	Aspects
1	<p>What is the problem(s) that you face during the teaching in distance learning (DL)?</p> <p>(Options)</p> <ul style="list-style-type: none"> <li>• Difficult to Track of learning learner’s learning process</li> <li>• Difficult to Communication to the learner</li> <li>• Difficult to Getting the feedback from the learner</li> <li>• Difficult to Provide the comment and feedback to the learner</li> <li>• Difficult to observe the learner about learning progress compare with other learners</li> <li>• Difficult to realized how the learner think of learning in the subject</li> <li>• Difficult to see the learner’s attention and understanding in the subject</li> <li>• Learner’s readiness in DL</li> <li>• Not suitable learning environment</li> <li>• Difficult to teach learners about EL concepts</li> <li>• Difficult to motivate the learners to learn and learner’s lack of Self-regulation</li> </ul>	<p>Problem and Difficulty of EL, SRL in DL</p> <p>Difficulties and Challenges based on the survey of the teacher as well.</p>
2	<p>Based on your selection(s) in (1), how can the system solve those problems and difficulties?</p>	
3	<p>Based on the report data of the learner, how do you use those data into the class teaching?</p>	<p>Report Data, Sensor Data</p>
4	<p>How this system helps the to improve the learning outcome, please provide the evidence</p>	<p>Learner changes, overall aspects</p>
5	<p>How the comment and feedback to the learner by using the system help the learner to improve the learning outcome? Please provide the evidence</p>	<p>Comment and Feedback for learner</p>

5	What do you think about the benefit to you and your student by using the system? Please provide the appropriate reason why?	Benefits of this system of teacher's aspects
6	If there is no such a system, what are the disadvantage to you and your student?	

**Appendix J: Learner TrackingData Generated from the Learning Environment (WBL.Education), The sample data of week # 6 of the learner ID: iPPE**

```

"6" : {
  "-MBOtXWhGYgDI_z10Xcn" : {
    "ac" : "แนวคิดที่ได้จากการสะท้อนตนเองจากความสำเร็จ คือ ....เราควรจะศึกษา ทำความเข้าใจในส่วนที่เราเรียนแล้วยังไม่เข้าใจ จะได้กลับมาทำ
ข้อสอบได้แบบโอเค และได้คะแนนดี",
    "ae" : "ข้าพเจ้ามีแผนที่จะ ..ขยันและตั้งใจหมั่นฝึกทำโอ๊คและเรียนรู้เกี่ยวกับภาษาจาวาในวิชา OOP ต่อไป เพื่อที่จะ ...มีประสบการณ์ในการทำงานเกี่ยวกับด้านการเขียนโอ๊คต่อไป เพื่อที่จะได้เขียนได้ไวและแม่นยำขึ้นครับ",
    "ce" : "จากประสบการณ์ที่ได้วางแผนมาของสัปดาห์ที่ผ่านมาเกี่ยวกับ ... การฝึกทำโอ๊ค เพื่อทำข้อสอบเก็บคะแนนในวันอังคารนี้ให้ได้คะแนน
เยอะๆ นั้น",
    "postWeek" : 6,
    "readTeacherComment" : false,
    "ro" : "จากประสบการณ์นั้นสิ่งที่ทำตามแผนได้สำเร็จคือ ทำความเข้าใจกับข้อสอบโอ๊คสั้นๆ และประสบความสำเร็จ เนื่องจาก ...ข้าพเจ้าได้
วางแผนในการสอบมาบ้าง ว่าต้องอ่านอะไร ฝึกตรงไหน",
    "submit" : true,
    "timeStarts" : "2020-07-04T12:51:08.321Z",
    "timesubmit" : "2020-07-04T12:56:18.744Z",
    "useNodeACAE" : "3-1-1",

```

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"useNodeAECE" : "4",

"useNodeCERO" : "1-4-1",

"useNodeROAC" : "2",

"useTeacherComment" : "",

"useWeekAE" : "",

"userID" : "iPPEvseRJPfRiPVnBFQfA1BOTZF2",

"userLogs" : [ {

  "event" : "select (CE->RO) Node:",

  "key" : "1",

  "time" : "2020-07-04T12:51:42.879Z"

}, {

  "event" : "select (CE->RO) Node:",

  "key" : "1-4",

  "time" : "2020-07-04T12:51:47.704Z"

}, {

  "event" : "select (CE->RO) Node:",

  "key" : "1-4-1",

  "time" : "2020-07-04T12:51:56.526Z"

}, {

  "event" : "typeCE:",
```

```
"key" : "จากประสบการณ์ที่ได้วางแผนมาของสัปดาห์ที่ผ่านมาเกี่ยวกับ ... ทำข้อสอบเก็บคะแนนในวันอังคารนี้ให้ได้คะแนนเยอะๆ เท่าที่จะทำได้  
ครับ",  
  
"time" : "2020-07-04T12:51:59.212Z"  
  
}, {  
  
"event" : "typeCE:",  
  
"key" : "จากประสบการณ์ที่ได้วางแผนมาของสัปดาห์ที่ผ่านมาเกี่ยวกับ ... d ทำข้อสอบเก็บคะแนนในวันอังคารนี้ให้ได้คะแนนเยอะๆ เท่าที่จะทำ  
ได้ครับ",  
  
"time" : "2020-07-04T12:52:02.598Z"  
  
}, {  
  
"event" : "typeCE:",  
  
"key" : "จากประสบการณ์ที่ได้วางแผนมาของสัปดาห์ที่ผ่านมาเกี่ยวกับ ... dk ทำข้อสอบเก็บคะแนนในวันอังคารนี้ให้ได้คะแนนเยอะๆ เท่าที่จะ  
ทำได้ครับ",  
  
"time" : "2020-07-04T12:52:02.751Z"  
  
}, {  
  
"event" : "typeCE:",  
  
"key" : "จากประสบการณ์ที่ได้วางแผนมาของสัปดาห์ที่ผ่านมาเกี่ยวกับ ... dki ทำข้อสอบเก็บคะแนนในวันอังคารนี้ให้ได้คะแนนเยอะๆ เท่าที่จะ  
ทำได้ครับ",  
  
"time" : "2020-07-04T12:52:02.975Z"
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