

A LEARNING AND DEVELOPMENT WITH COLLABORATIVE NOTE- TAKING MODEL FOR
ENHANCING THE FUTURE HIGHER EDUCATION STUDENTS' WORKFORCE SKILLS IN
SOCIO- EMOTIONAL REGULATION AND GRIT BASED ON A WEB 5.0 APPROACH



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A Dissertation Submitted in Partial Fulfillment of the Requirements
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Department of Educational Technology and Communications

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รูปแบบการเรียนรู้และพัฒนาด้วยกระบวนการจัดบันทึกร่วมกันที่เสริมสร้างทักษะอนาคตของผู้เรียน
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การวิจัยและพัฒนาแบบพหุวิธี มีวัตถุประสงค์เพื่อ: 1) ศึกษากรอบแนวคิดการกำกับสังคมอารมณ์ของผู้เรียนระดับอุดมศึกษาเพื่อส่งเสริมการกำกับสังคมอารมณ์และความเพียร 2) เพื่อศึกษาผลของการกำกับสังคมอารมณ์ ด้วยการใช้การจดบันทึกร่วมกันตามกรอบแนวทางเว็บ 5.0 ที่มีต่อที่มีต่อความเพียร 3) เพื่อศึกษาหลักการออกแบบเชิงกระบวนการเกี่ยวกับการประยุกต์ใช้เทคโนโลยีเพื่อการศึกษาโดยใช้กระบวนการจัดบันทึกร่วมกันตามกรอบแนวทางเว็บ 5.0 กลุ่มตัวอย่างในการวิจัยในครั้งนี้ ประกอบด้วย นิสิตระดับบัณฑิตศึกษาจำนวน 365 คน ที่ได้จากการสุ่มแบบหลายขั้นตอน ร่วมตอบสอบถามออนไลน์ นอกจากนี้ยังประกอบด้วยกลุ่มตัวอย่างผู้เชี่ยวชาญ จำนวน 5 คน และนิสิตระดับบัณฑิตศึกษาจำนวน 11 คน ที่ได้จากการเลือกกลุ่มตัวอย่างแบบเจาะจง เข้าร่วมในการวิจัยการออกแบบทางการศึกษา กลุ่มนิสิตระดับบัณฑิตศึกษาจำนวน 14 คน จากการเลือกกลุ่มตัวอย่างแบบเจาะจง เข้าร่วมการศึกษาแบบกลุ่มเดี่ยววัดหลายครั้งแบบอนุกรมเวลา และกลุ่มผู้เชี่ยวชาญ 5 คน เข้าร่วมการประเมินรับรองชุดนวัตกรรม การศึกษานี้ใช้ระเบียบวิธีวิจัยที่หลากหลาย ประกอบด้วย การวิเคราะห์องค์ประกอบเชิงยืนยัน การวิเคราะห์โมเดลเชิงสาเหตุ และการวิจัยการออกแบบ เครื่องมือที่ใช้ในการใช้ข้อมูลเชิงปริมาณ ประกอบด้วย แบบสังเกตการใช้ งาน แบบสำรวจความพึงพอใจของผู้ใช้ และแบบประเมินโครงสร้างวิทยานิพนธ์ เครื่องมือที่ใช้ในการทดลองกับผู้ได้แก่ ด้นแบบเว็บ 5.0 คู่มือผู้ใช้ และแผนกิจกรรมการเรียนรู้และพัฒนา วิเคราะห์ข้อมูลด้วยสถิติบรรยาย การวิเคราะห์องค์ประกอบเชิงยืนยัน การวิเคราะห์โมเดลเชิงสาเหตุ และการวิเคราะห์ความแปรปรวนเมื่อมีการวัดซ้ำ

ผลการวิจัยแสดงให้เห็นว่าโมเดลอิทธิพลเชิงสาเหตุสอดคล้องกับข้อมูลเชิงประจักษ์อย่างนัยสำคัญทางสถิติตามเกณฑ์ความสอดคล้องของโมเดลในระดับที่ยอมรับได้ ซึ่งการกำกับสังคมและอารมณ์มีอิทธิพลทางตรงต่อทักษะทางสังคมและอารมณ์ ($r = .801, p < .001$) และทักษะทางสังคมและอารมณ์ ส่งอิทธิพลทางตรงต่อความเพียร ($r = 1.000, p < .001$) นอกจากนี้ยังพบว่าค่าเฉลี่ยของทักษะทางสังคมและอารมณ์ และความเพียรของนิสิตระดับบัณฑิตศึกษาสูงขึ้นอย่างมีนัยสำคัญทางสถิติอย่างน้อยสองช่วงเวลา ($F(1, 2) = 4190.43, p < .05$)

งานวิจัยชิ้นนี้นำเสนอองค์ประกอบสามประการที่เกิดจากการกำกับตนเองและการเรียนรู้ทางสังคม ได้แก่ พันธมิตรทางสังคม กิจกรรมทางสังคม และการแบ่งปันอารมณ์ทางสังคม ด้วยการพัฒนาแพลตฟอร์มทดลอง "โซซิโม" เว็บแอปพลิเคชันมีองค์ประกอบและฟังก์ชันหลัก 6 ประการ ได้แก่ แดชบอร์ด การตั้งค่าโปรไฟล์ พื้นที่สำหรับสมาชิกในทีม การแสดงผลแบบมีปฏิสัมพันธ์ ส่วนการแบ่งปันและการแสดงความเอาใจใส่ และเครื่องมือสะท้อนอารมณ์ แนวทางปฏิบัติและหลักการออกแบบการผลิตเพื่อปรับปรุงการนำไปใช้ ได้แก่ 1) สภาพแวดล้อมการทำงานทางสังคมที่มีนวัตกรรม สร้างสรรค์ และร่วมมือกันมากขึ้น 2) การออกแบบทักษะทางสังคมอารมณ์ และความเพียรซึ่งผลกระทบต่อสังคม 3) เครื่องมือกำกับสังคมอารมณ์ที่มีปฏิสัมพันธ์ แบ่งปัน และติดต่อกับผู้อื่น ภายใต้การมีส่วนร่วมของสมาชิกในกลุ่ม

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The multi-methods research and development (R&D) aim to: 1) investigate the socio-emotional regulation framework to promote higher education students' future workforce skills in social and emotional regulation and grit, 2) investigate how socio-emotional regulation impacts grit based on instructional technology via online social collaborative note-taking in the web 5.0, and 3) define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0. In this study, 365 graduate students from multi-stage random sampling participated in the online survey, 5 experts and 11 graduate students with purposive selection participated in the design research method, 14 graduate students participated in the one-shot repeated measured experiment, and 5 experts participated in the innovation evaluation procedure. This study employs multiple methodologies, including the confirmatory factor analysis (CFA), structural equation modeling (SEM), and design research. The instruments used to employ quantitative data included: usability observation form, users' satisfaction survey, and dissertation proposal assessment form. The web 5.0 prototype, users' guide, and learning and development activity plan are the instruments used to experiment with users. Data were analyzed using descriptive statistics, confirmatory factor analysis, structural equation modeling, and repeated measures ANOVA.

The findings show how the model's overall goodness-of-fit is statistically significant, indicating that it fits the model-fit criteria and gives an acceptable fit interpretation. In which socio-emotional regulation was directly and positively linked with social and emotional skills ($r = .801$, $p < .001$) and was directly and positively connected with grit ($r = 1.000$, $p < .001$). It has been found that the mean of social and emotional skills and grit were increasing accordingly. In which we have found a statistically significant difference in social and emotional skills between at least two periods of time ($F(1, 2) = 4190.43$, $p < .05$).

Lastly, this research highlights three components arising from self-regulation and social cognitive learning: social partners, social activities, and social sharing of emotion. With the development of "Sociemo" experimental platform, the web application offers six key elements and functions: a dashboard, profile settings, a team members area, an interactive review component, a sharing and empathy part, and an emotion reflection tool. The solution of practice and production design principles and design guidelines to improve solution implementation are 1) a socialized work environment that is more innovative, creative, and collaborative, 2) perseverance demands attention and social-emotional determination in which a person has an impact on society, 3) socio-emotional regulation tools that are interacting, sharing, and dealing with others to get everyone involved.

Field of Study:	Educational Technology and Communications	Student's Signature
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		Co-advisor's Signature
		Co-advisor's Signature

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CHAPTER I

INTRODUCTION

Background of the Study

In the digital transformation era, the demand for workforce skills has been changed over time. Adopting automation and artificial intelligence (AI) technology will transform human work to an automated future. The human might work less on physical and manual skills; on the other hand, social and emotional skills are listed as new highlight skills for the future of the workforce as machines can't master. These non-cognitive skills will grow rapidly over the next decade.

The McKinsey Global Institute has reported the decreasing needs of physical and basic cognitive skills. Whilst there is the rise of demanding in social and emotional skills for the future of workforce such as advanced communication & negotiation skills, interpersonal skills & empathy, and higher cognitive skills by year 2030 (Bingham & Conner, 2010; Bughin et al., 2018; Johnson et al., 2018; World Economic Forum, 2016). The role of social and emotional skills in changing environments means engaging and adjusting the new ways of thinking, working, and meeting with new people in a different environment, trust, and compassion. Co-operation has shifted the traditional social networks to the new pace of technology that calls for the ability to act independently and to adjust to changes on the go (OECD, 2019).

COVID-19 has recently been a source of stress in everyday life, prompting the need to adapt emotion regulation strategies to the social sharing process (Lohani, Dutton, & Elsey, 2022). The development of *social and emotional skills*, such as perseverance, sociability, and self-esteem, have been shown in numerous social outcomes; measurement is therefore essential (OECD, 2015). One example is forming

professional network by linking experiences and expertise, including various experts accomplished in the pedagogical practice (Patterson, 2019).

The widespread of learning is ubiquitous where learning takes place everywhere, not only through a formal route, such as workshops, classroom learning, or other organized forms of learning. Learning can also occur in an integral part of work e.g., learning by working with others, asking colleagues questions, and observing experienced people follow a vocational pathway (Littlejohn, Jaldemark, Vrieling-Teunter, & Nijland, 2019). The synthesized results from nine social and emotional learning frameworks showed that the CASEL framework initiated by Collaborative for Academic (2017) is one of the most widely used model to develop social and emotional learning (SEL). The framework has covered self-level skills including self-awareness, self-management, and the social-perspective-taking. As well as social-level skills including social awareness, relationship skills and responsibility for decision-making which is necessary for learning not only the K-12 levels but, it can be applied into early adults, middle-aged adults, and also older adults. This professional learning pathway is also the collecting of individuals' perseverance and passion for long-term goals and accumulating of "**grit**" (Angela L. Duckworth, Peterson, Matthews, & Kelly, 2007). Previous research examining the current COVID-19 pandemic has caused substantial changes in the workforce and workflows. The development of grit, motivation, and resilience in the pharmaceutical field has become a hot topic. Several attempts have been made to study the relationship between grit and academic outcomes focusing on building grittiness in students (Pleace & Nicholls, 2022; Whitfield & Wilby, 2021). Furthermore, the link between grit and well-being is increasingly being explored in research areas such as academic outcomes, psychological outcomes, and work-related performance (Datu, 2021).

In higher education, graduate students attending a university need to develop **research performance and skills**, which are highly important to achieve the degree. For Thailand's context, the Office of the Higher Education Commission (2006) defines

the Qualifications Framework for Thailand's higher education. The framework comprises the characteristics of graduates to draw on a wide range of theoretical and practical knowledge, exercise effective leadership, provide a positive influence to others through example and leadership in professional and community life. To achieve those goals, previous research has consistently shown that there are many factors influencing the graduate study, including the internal perspective (e.g., academic writing, supervisory relationships, interactions with peers) and the external perspective (e.g., responses to non-academic career goals or pressure to reduce time to completion (McAlpine & Amundsen, 2011). For example, the social aspect of human existence seems to be the key to success. Previous studies have reported socio-cultural factors in building community within the researcher preparation activities with the involvement of interactions and experiences with others (Bindlish, Joshi, Dutt, Verma, & Arora, 2017), for example, the mentor who is influenced by the significance of the graduate study program (Rose, 2005).

In this study, we looked at the learning and development concepts related to social cognitive theory, self-regulated learning, and the 70-20-10 learning and development model. *Social cognitive theory*, is the grounded theory where learners perform their behavior through their learning on the central processing of response by observing a model of desired behavior and modelling in four component processes; attention, retention, motor reproduction, and motivational process (Bandura, 1991) to create self-understanding, emotion understanding, awareness of how the self relates to others in the social competence (Thompson, 2007). The previous study has shown that group intervention can help emerging adults cope with the stress of graduate school (Thonhauser, 2022).

To create such a meaningful professional community that links between developing cognitive skills and soft-skills especially social and emotional skills and grit, the new paradigm of digital learning 2.0 has been developed. Learning is no longer just about content and knowledge but related to the experience and

application (Kang, 2019) is one of the most rapidly growing concepts. The widespread use of the **70-20-10 learning and development model** as a part of digital learning 2.0 is recognized by experts and practitioners worldwide. The combinations of 70 percent of a real-life and on-the-job experience, tasks and problem solving. The 20 percent comes from other people through an informal learning, mentoring or coaching. Last 10 percent comes from a formal training (Bingham & Conner, 2010; Johnson et al., 2018). Throughout the 70-20-10 learning and development model, social and emotional skills may develop as the noncognitive skills, including, three broad areas of thinking, behavior, and self-control (McKown, 2017). Learning overall in the 70-20-10 model is, therefore, not only the learning from formal training, but learning with others and practicing on-the-job experiences (Kang, 2019). This practical learning and development program combine formal, social, and experiential appearances.

Within the 70-20-10 learning model, self-regulation is also at the heart of success in learning and development goals. Self-regulation processes shared the same concepts with the 70-20-10 learning model in self-generated thoughts, feelings, and behaviors using the self-directed to control behavior to attain goals (Zimmerman, 2002). Previous research has focused on **self-regulated learning** based on the idea of helping learners develop their own pace of learning through the use of a self-regulation strategy (Zimmerman, Bonner, & Kovach, 2009). At the individual level, self-regulation of behavior, emotions, and cognition was developed. Zimmerman (1989)'s Triadic model of self-regulation learning has followed a social cognitive perspective, where self-regulation is the distinctive interaction of personal, behavioral, and triadic environment processes. Therefore, regulation of one's self may contain three factors: behavior regulation, cognitive regulation, and emotion regulation (Buzza & Allinotte, 2013; Ifenthaler, 2012; Peeters et al., 2014). Behavior Regulation influences one's thoughts, feelings, and actions adjusting performance processes toward strategies. Cognitive regulation influences one is monitoring and

adjusting to the cognitive and emotional states. Emotion regulation influences one's emotion recognition and regulation, which can change the current emotional state.

There is a possibility of using a *socio-emotional regulation* strategy, and the 70-20-10 learning model in the context of social cognitive learning to develop social and emotional skills and grit. Socio-emotional regulation could be defined as the regulation of behavior, emotions, and social cognition that influences to perform of tasks and to solve a problem together by developing an understanding of those topics at shared-level in the collaborative learning group (Allal, 2018; De Backer et al., 2018; Greisel et al., 2018; Järvelä et al., 2015; Lehraus & Marcoux, 2018; Saariaho et al., 2018; Saariaho et al., 2019; Zimmerman, 2000). There are two supported theories, the life span theory related to social motivation, called "socioemotional selective theory (SST)". Carstensen (1992) work on SST theory helps us shape the idea that social motives fall into 1 of 2 categories: the acquisition of knowledge and its relation to emotion regulation. According to previous research (Carstensen, Fung, & Charles, 2003; Dudley & Multhaup, 2005), it has found that late adolescence (at undergraduate level) and early adulthood tend to acquire knowledge rather than regulate their emotional states, while in adulthood, people consider the selection of social partner who they are satisfied, with fewer people who know them well. The empirical finding revealed that self and others merge entirely in empathy (Decety & Batson, 2009).

Research in social-emotional skills has consistently shown the development of the social-perspective level, including social awareness, relationship skills, and responsible decision-making. According to Zimmerman (2000), researchers are interested in the social influences on children's development of self-regulation, too. Recent development in social and emotional fields has led to renewed interest in social perspective-taking, in which social interaction and engagement are also necessary (Kim et al., 2018). Therefore, the regulations of cognitive, behavior, and

emotions might not stand alone at the individual level. The collectively shared regulatory processes, or so-called “*socially shared regulation*”, plays a central role in producing regulated collaborative processes and social interactions (Järvelä et al., 2015). The possibility of the regulation concept has recently been challenged by many researchers who tried to bring regulation at self- level to the cooperation and collaboration processes. McPherson and Zimmerman (2011) highlight the socially of the self-regulation in which learners rely on and seek help from knowledgeable people when they face difficulties. Overall, socially-shared regulation is defined as the regulation of environmental influences to solve a problem together by jointly developing an understanding of those topics at a shared level in the collaborative learning group in which the whole group members make decisions together in a shared way. (Allal, 2018; De Backer et al., 2018; Greisel et al., 2018; Järvelä et al., 2015; Lehraus & Marcoux, 2018; Saariaho et al., 2018; Saariaho et al., 2019; Zimmerman, 2000). With a growing need for a growing number of tools created to foster awareness and effective regulation in collaborative learning, there is a need to develop design principles for supporting socially shared learning to provide direct instruction on social regulation strategies (Lyons, Lobczowski, Greene, Whitley, & McLaughlin, 2021).

To establish the learning and development model, as mentioned above in digital learning 2.0, previous studies brought the ideas of self-regulation learning, which can be used as a strategy to equip students with more positive views toward social behavior and life-long learning skills. However, the next step of the study could draw attention to promoting self-regulated learning supportive components in the existing program (Buzza & Allinotte, 2013). Social sharing of emotion plays a role in many accounts of empathy.

Emotional Web or Web 5.0 is one of the most rapidly growing tools for learning. Web 5.0 indicates the sensory and emotional knowledge working together, which can be used as a tool for communications, the information provided, and

problem-solving tasks in which emotions play an important role in human and computer interaction and allow users to interact with content. (Benito-Osorio et al., 2013; Martín de Diego et al., 2018). Many accounts of empathy also emphasize the need to sharing emotions. On the other hand, some combine emotion sharing with emotional "contagion," dismissing it as a sort of empathy in which sharing serves as a credible source of information about others (Gatya, 2022). The benefit of emotion recognition technology on Web 5.0 could help increase human and computer interactions, as the human-machine-interaction theory is extracted into three consecutive procedures: emotion elicitation, emotion recognition, and emotion behavior generation (Egger, Ley, & Hanke, 2019). Shu et al. (2018) have brought up the idea of emotion recognition through physiological signals and emotion models. For example, Löw, Gad-El-Hak, Ganhör, and Tellioglu (2015) make the learner reflect on their emotions through ZENse – a prototype used to support positive psychology development by using the personal monitoring and feedback systems. Moreover, several researchers (György & Watson, 1999; Pellerin & Lecours, 2015) explained the idea of "social-biofeedback model," which indicates sharing emotion expressive displays with caregivers to increase emotional self-awareness and control. The feature of emotion reflection might be applied in the web 5.0 process in which learners share emotions with others to regulate self-control of emotion-related experiences, physiological responses, and behaviors. To combine these ideas, there is a tool called "collaborative-note-taking," which can be embedded into the learning process. For example, drawing mandala as a self-reflection tool (Marshall, 2003; Tucci, 2001) and expressive writing (Lepore, Greenberg, & Bruno, 2002) might help adjust emotions, and collaborative note-taking could be used as a task-oriented tool. As social and emotional skills become a new highlight in which new ways of learning are related to the regulation of one's thoughts, emotions, and behavior by perceiving themselves and engaging with others in social activities. Putting these functions above can be integrated into "web 5.0".

Research Conceptual Framework

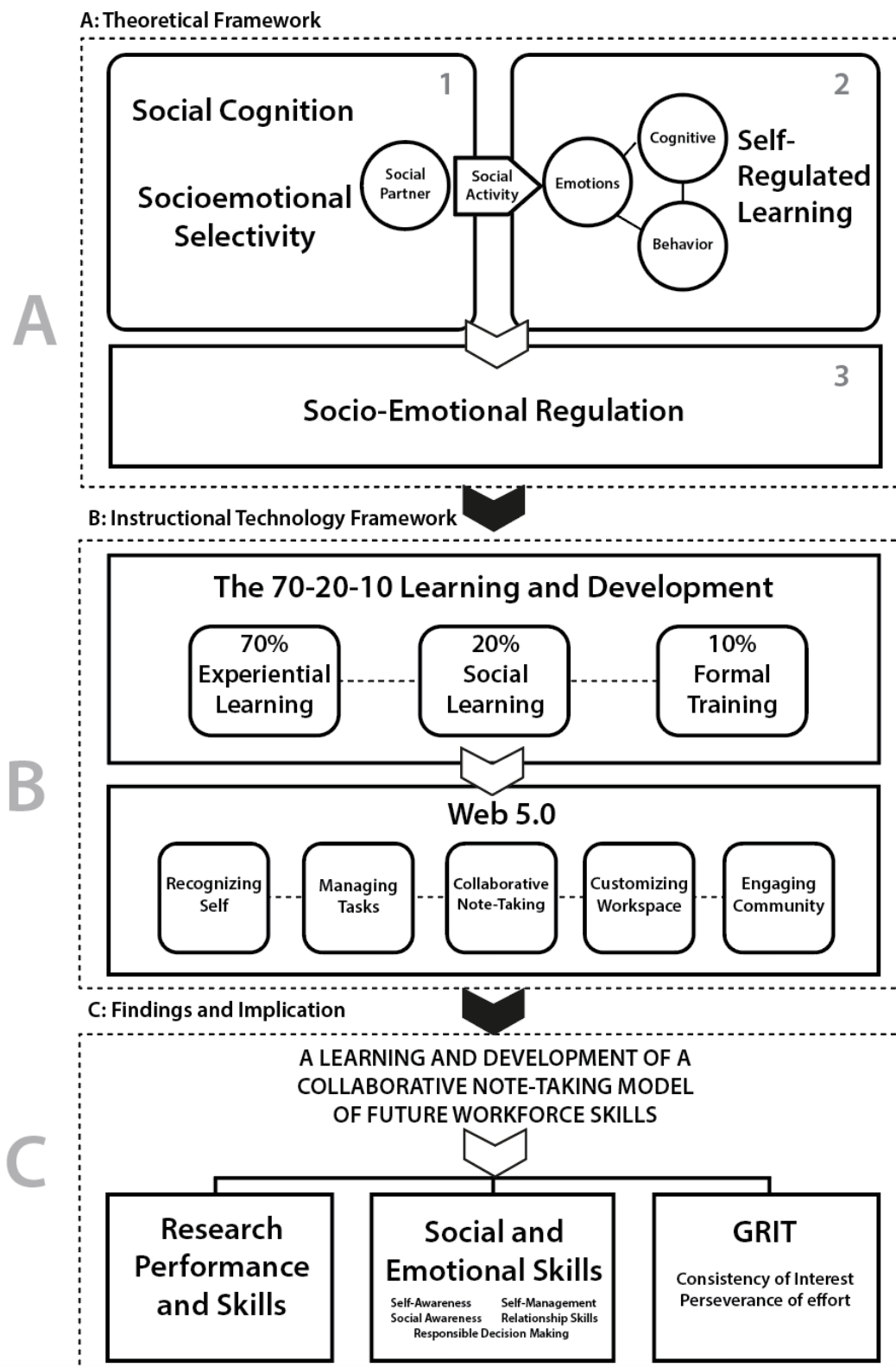


Figure 1 Summary of Conceptual Framework

The framework aims to improve the cognitive skills selected for research performance as well as social and emotional skills and grit (figure 1). This framework is derived from three broad educational concepts and instructional design tools (i.e., web 5.0). As shown in figure 1. **A1.** social cognitive theory and socioemotional selectivity theory highlight the importance of working with social partners via social activity. According to the educational concepts presented in this framework, the research considers social cognition and self-regulated learning (**A2**), which are connected through social activity- for example, learning with others in social learning. Besides regulating cognition, behavior, and emotions to control oneself, learners might practice social cognition skills through social activities.

Secondly, as shown in **A3.** on the diagram, socio-emotional regulation involves self-regulated learning and working with others at a shared-level. Socio-emotional regulation is defined as the regulation of environmental influences to perform tasks and solve problems together by developing an understanding of those topics at a shared-level in the collaborative learning group.

Thirdly, as presented in **B**, the structure of the 70-20-10 learning and development might be embedded into the learning design as the learning context. For instance, the goal of learning in the 70-20-10 learning and development model is to develop research problems and questions and search relevant literature to establish academics where working on the research project is required to achieve a degree for graduate students. The 70-20-10 learning and development model comprises 70% experiential learning, 20% social learning, and 10% formal training.

For the experimental study, the emotional web or “web 5.0” will be used as a tool for the learning and development process in which it has the potential to bring the three educational concepts (A) above together. The web 5.0 instructional design methodology will be developed regarding the following dominant features of collaborative note-taking; recognizing self, managing tasks, collaborative note-taking, customizing workspace, and engaging the community to improve the learning and development process.

Lastly, the findings and implication of this framework and web 5.0 is expected to impact the learner's behavior changes in developing 1) research performance and skills, 2) social and emotional skills (self-awareness, self-management, social awareness, relationship skills, and responsible decision making), and 3) grit (consistency of interest, perseverance of effort). This study will provide an important opportunity to advance the understanding of new learning and development model of workforce skills of the future of graduate students via collaborative note-taking in web 5.0. The findings will serve as a practical application in professional development to create a more efficiently workforce skills of the future. See the complete framework and detailed definitions in figure 2.



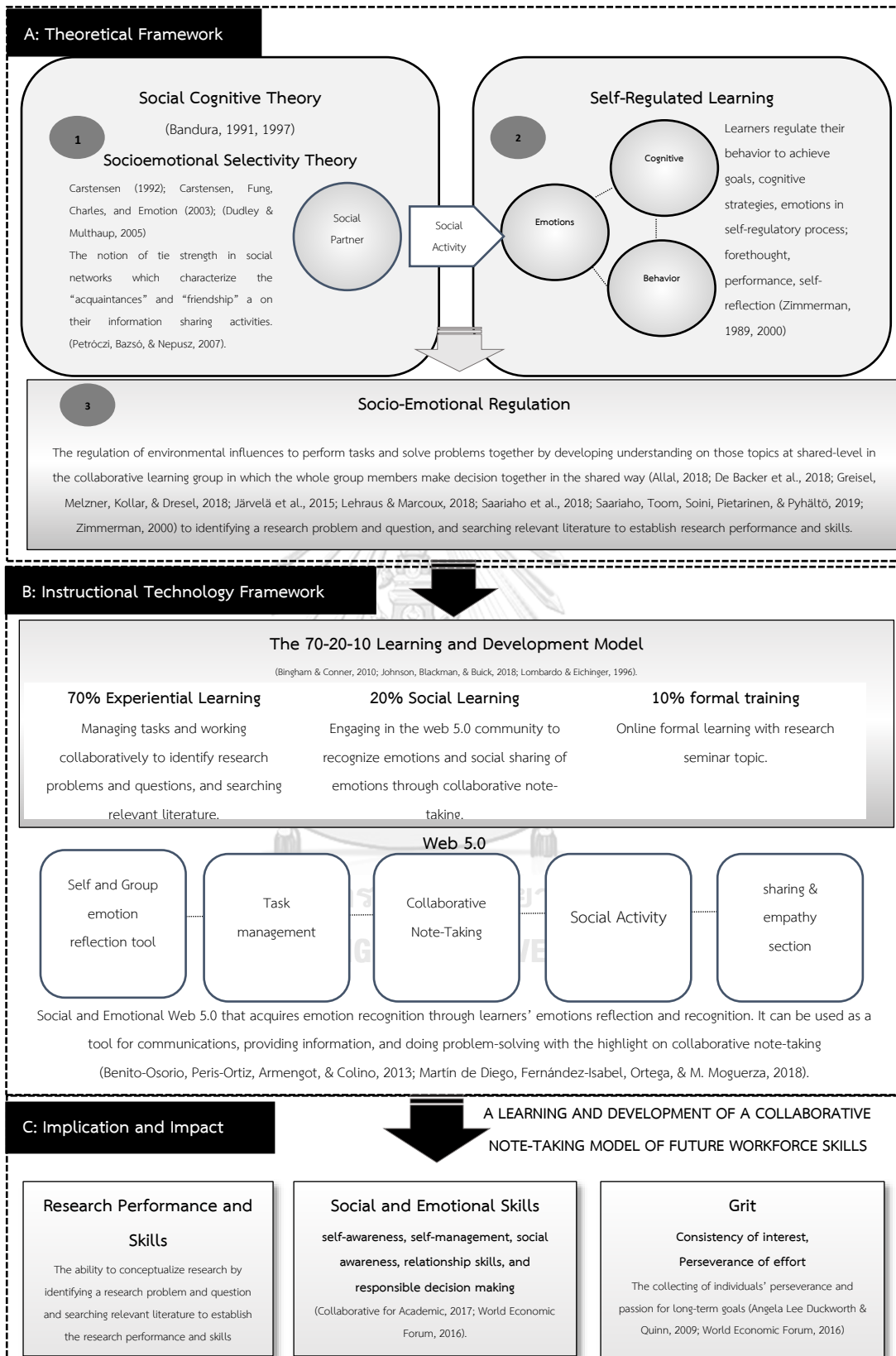


Figure 2 Research Conceptual Framework

Research Objectives

1. To investigate the socio-emotional regulation framework to promote higher education students' future workforce skills in social and emotional regulation and grit.
2. To investigate how socio-emotional regulation impacts grit based on instructional technology via online social collaborative note-taking in the web 5.0.
3. To define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

Research Questions

1. What are the factors in self-regulation that affect social and emotional skills and grit?
2. What are the components and procedures of the learning & development (L&D) model via collaborative note-taking in the web 5.0 to develop workforce skills of the future in social-emotional skills and grit?
3. How does the effort to design interventions via the empirical L&D model influence the outcome in the web 5.0 approach?

Research Hypotheses:

From the study of literature and related research, we have found that the social-cognitive domain is underpinned by social behavior (Adolphs, 2003). Amodio (2008) discussed that self-regulation of intergroup responses involves multiple coordinated underlying processes. While forming the professional network by linking experience and expertise including various representations, experts, accomplished in representing pedagogical practice (Patterson, 2019) in formal and informal routes (Littlejohn et al., 2019). Some of the broad concepts link self-regulation processes in professional learning to be applied to social and emotional development. This can be seen in McKown, Gumbiner, Russo-Ponsaran, and Lipton (2009); the more children developed their regulation processes, the more they increased measures of social-

emotional skills. Previous studies have reported that pre-service teachers' self-reported strategy scores predicted the performance of self-regulation learning (Buzza & Allinotte, 2013); Saariaho et al. (2019) and the success in the educational innovation projects Peeters et al. (2014). Lastly, the collection of individuals' perseverance and passion for long-term goals will lead to individuals' grit (Angela L. Duckworth et al., 2007). We also have found that social and emotional learning web is illustrated and narrated with pictorial faced-choice responses, which are used to assess social and emotional comprehension (McKown, 2018, 2019; McKown, Allen, Russo-Ponsaran, & Johnson, 2013; McKown et al., 2009). From the statements above, the researcher, therefore, the hypothesizes were proposed as follows:

1) After the experiment, the social and emotional skills and grit are significantly higher than the pretest level.

Scope of the Study

Population

The population of experts for brainstorming ideas and constructing opinions is the experts in educational technology and communications or instructional web designer, computer science, neurology, social psychology, educational research, educational measurement and evaluation, and English teaching or linguistics.

The population used in the experiment is the graduate students in higher education institutes under the Ministry of Higher Education, Science, Research and Innovation at the graduate diploma, master's degree, higher graduate diploma, and doctoral degree, with a total number of 1,555,214 people.

Variables

The variables included;

The independent variables are the learning and development of future workforce skills (socio-emotional regulation and grit) of graduate students via collaborative note-taking in web 5.0.

The **dependent variables** are social and emotional skills and grit.

Operational Definitions of Terms

The terminologies employed in this study were as follows:

The Learning and Development Model is the context of professional learning in this study where the acquisition of knowledge and experience come from self-learning, experts, and practitioners (Bingham & Conner, 2010; Johnson et al., 2018; Lombardo & Eichinger, 1996). The combinations of 70-20-10 learning are as follows; 70 percent of tasks with experiential learning, 20 of social learning, mentoring or coaching in a digital learning environment. The last 10 percent comes from formal learning. The learning context requires the involvement of peers, seniors, advisors, co-workers, and experts in the field.

Workforce Skills of the Future is defined as the development of non-cognitive skills: socio-emotional regulation and grit. Socio-emotional regulation is generated from social cognitive and socioemotional selectivity theory, with the self-regulated learning and the relationships to the development of social and emotional skills. Grit is accumulated by collecting individuals' perseverance and passion for long-term goals in performing research in graduate study.

Self-Regulation is defined as the learner can regulate their behavior to achieve goals, cognitive strategies, and emotions in the self-regulatory process; forethought, performance, and self-reflection (Zimmerman, 1989, 2000). The details of each domain are as follows; **Behavior Regulation** refers to the ability to control oneself in performing tasks by following the cyclical self-regulatory phases; **Cognitive regulation** refers to the ability to monitor and adjust to the cognitive, being inhibition or dismissing distracting and switching of attention from the task in initiating research ideas by identifying a research problem and question, and searching relevant literature., **Emotions regulation** refers to the influences on one's

recognition of emotions and regulation of emotions to control working on the assigned tasks with others and dealing with distractions.

Socio-Emotional regulation is defined as the regulation of behavior, emotions, and social cognition that influences to perform tasks and solve problem together by develop understanding on those topics at shared-level in the collaborative learning group which the whole group members make decision together in the shared way (Allal, 2018; De Backer et al., 2018; Greisel et al., 2018; Järvelä et al., 2015; Lehraus & Marcoux, 2018; Saariaho et al., 2018; Saariaho et al., 2019; Zimmerman, 2000).

Web 5.0 is defined as emotional Web 5.0 that acquires emotion recognition through learners' emotional reflection and bio-sensory emotion recognition. SEL Web 5.0 can be used as a tool for communications, providing information, and problem-solving tasks. Emotions play an essential role in human and computer interaction and computer-supportive collaboration learning (CSCL). SEL Web 5.0 will allow users to interact with content (Benito-Osorio et al., 2013; Martín de Diego et al., 2018) with the following dominant features; recognizing self, managing tasks, collaborative-note-taking, customizing workspace, and engaging community.

Collaborative Note-taking is listed under the web 5.0 platform in both collaborative learning and learning contexts to help facilitate cognitive learning (improving research performance and skills) and non-cognitive (social and emotional learning, grit). Collaborative note-taking is a responsibility in sharing note via Google document and the developed platform.

Research performance and skills are defined as the ability to conceptualize research by identifying a research problem and question and searching relevant literature to establish the research performance and skills, where working on a research project is required to achieve the degree. Students will select a topic and formulate a researchable research problem, literature review to identify key theories,

terminologies, concepts, methods, data and interpretations and identify what is not known, missing or problematic in the literature by discussing with instructor, peers, seniors (current student or alumni), and co-workers or experts in the field to construct their research problem and research questions. The research performance and skills are evaluated through students' reflection, check-list items, and the thesis advisor.

Social and Emotional Skills is defined as the ability to apply knowledge, attitudes, and skills to achieve positive goals by regulating behavior and emotions both in oneself and social behavior. This study adopted the CASEL framework of social and emotional learning (SEL) which social and emotional learning competencies comprise five domains of skills; self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (Collaborative for Academic, 2017). The social and emotional skills are measured by using self-report (developing in this study).

Grit is defined as the professional learning pathway and is also the collecting of individuals' perseverance and passion for long-term goals. In this study, the term grit has been applied to the situation of research practice which long-term goals is related to the professional development. Grit is measured by the self-report eight items of the short grit scale (Grit-S) developed by Angela Lee Duckworth and Quinn (2009)

Significance of the study

Significance to the Academic Impact

1. The empirical data from the structural equation modeling (SEM) may shed light on the socio-emotional regulation approach in social and emotional learning and grit.

2. The results of this study may suggest a broader hypothesis for further research regarding using the socio-emotional regulation learning approach in various disciplines and in professional network development.

Significance to the Public Service

1. The proposed model of learning & development model via collaborative note-taking in the web 5.0 using a socio-emotional regulation strategy in a 70-20-10 learning context may be used as an instructional strategy to develop social and emotional skills and grit for graduate students.
2. The developed collaborative note-taking via web 5.0 using a socio-emotional regulation strategy may be used as an effective tool in the 70-20-10 learning context.

Significance of Public Policy

1. The research findings may be applied into public policy to promote professional learning in the field, interdisciplinary, transdisciplinary learning networks. The socio-emotional regulation might be used as a potential process and strategy to develop the workforce skills of the future (socio-emotional regulation and grit).

CHAPTER II

REVIEW OF LITERATURE

Chapter Overview

The purpose of the literature review section is to outline the following vital structures;

- The establishment of a context to locate a study in time, the identification of current theory, discoveries, and debates, including an evaluation and a nomination of gaps in the literature corresponding to social learning, social-emotional learning, grit, professional development, self-regulation. This literature review also provides the features of socially-shared regulation and the 70: 20: 10 learning model, which is the new way of working and regulating collaboratively in professional development.
- Preliminary investigations to clarify and formulate hypotheses and focus areas to the research framework using the structural equation modeling (SEM) approach.
- The understanding of current practices and technologies with the synthesis of Web of Emotions (web 5.0) and its emotions recognition techniques together with the review of applications related to the developmental phase.

Finally, we examine the related research in terms of social-emotional learning and emotion recognition in professional development. The proposed literature is as follows the [figure 3].

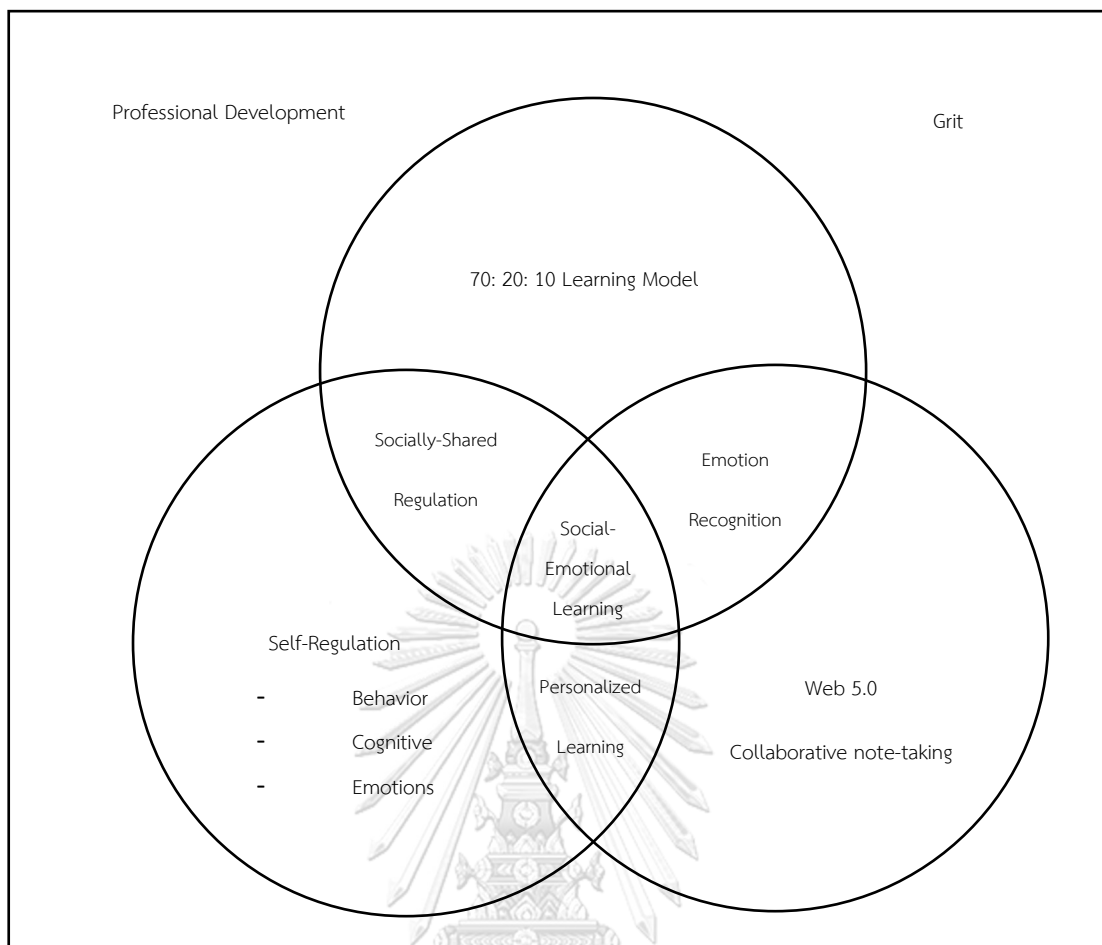


Figure 3 Review of literature diagram

The topics of literature are including;

1. Social Learning

- 1.1 Social Cognitive Theory
- 1.2 Socioemotional Selectivity Theory
- 1.3 Social Neuroscience

2. Social and Emotional Learning

- 2.1 Definitions of Social and Emotional Learning
- 2.2 Social and Emotional Learning Frameworks
- 2.3 Social and Emotional Skills
- 2.4 Social and Emotional Development
- 2.5 Social and Emotional Measurements

3. Grit

- 3.1 Definitions of Grit
- 3.2 Grit and Social-Emotional Learning
- 3.3 Grit Scale

4. Self-Regulation

- 4.1 Self-Regulation Theory
- 4.2 A Synthesis of Self-Regulation Model
- 4.3 Self-Regulation Measurement
- 4.4 Behavior Regulation
- 4.5 Cognitive Regulation
- 4.6 Emotion Regulation
- 4.7 Self-Regulation in Practice

5. Socially-Shared Regulation

- 5.1 Self-, Co-, and Socially-Shared Regulation

6. 70: 20: 10 Learning model

7. Social Tie-Strength

8. Web of Emotions

- 8.1 Emotion Recognition
- 8.2 Collaborative Note-taking
- 8.3 Web 5.0 Technology

9. Related Research and Review of Prototypes

- 9.1 Prototype on emotion-recognition
- 9.2 Web 5.0 Framework & Prototype



1. Social Learning

1.1 Social Cognitive Theory

The social learning principal highlighted that motivations of behavior is distinguished between the acquisition and performance by adapting modeled behavior which is valuable to them. Bandura (1976), the founder of the theory proposed the interaction of persons and situation and the behavior results called “Reciprocal Determinism” including behavior, other personal factors (in the form of cognitive, affective, biological events), and environmental factors all associated with each other [as shown in figure 4]. The relationship between personal factors, behavior, and environment

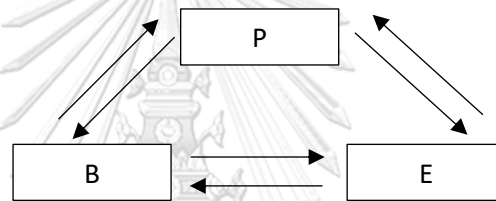


Figure 4 Reciprocal Determinism Model

Thus, the outcome expectation is arisen from 3 major forms; person, behavior, and outcome. Efficacy beliefs and outcomes expectancies have its own relationship in functioning. When people have the efficacy beliefs (vary in level, strength, and generality), they will perform behavior which outcome expectancies has flown from physical, social, and self-evaluation.

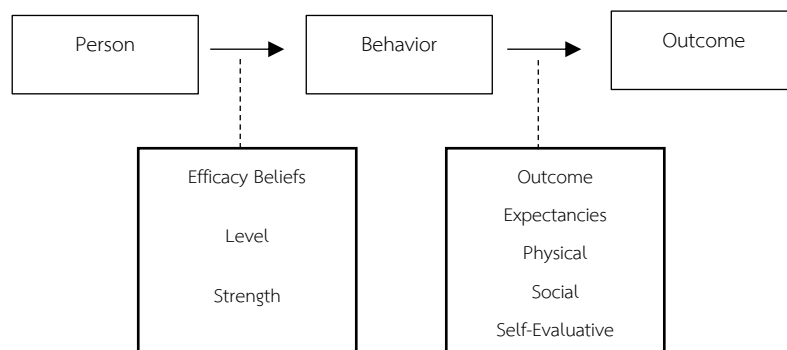


Figure 5 Relationships between efficacy beliefs and outcome expectancies

(Bandura, 1997)

Expectations of personal efficacy are depended on several sources which are the performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1976).

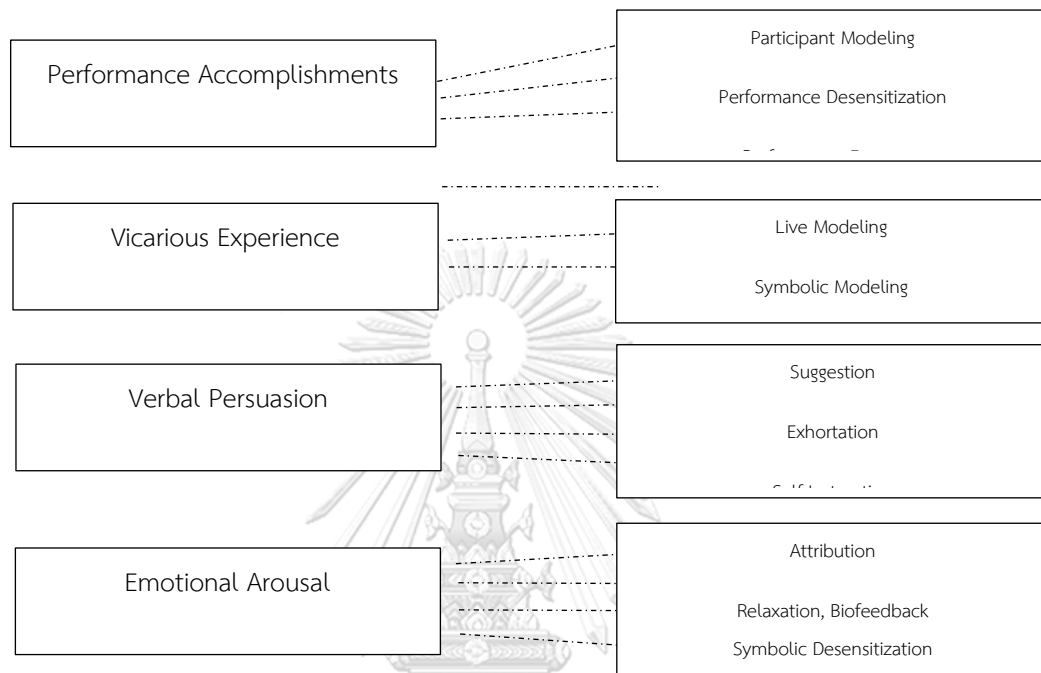


Figure 6 Efficacy Expectation

The learning through observing others people's behavior. Complex behavior is produced through the aid of modeling and dealing with environment through 3 processes; Attentional Process which learning by the selectivity observed when learners perceived accurately the model, Retention Processes which learning through the observations, medium symbols (imaginal and verbal), transitory modelling to maintain the long-term memory, and Motor Reproduction Process by converting symbolic into the appropriate actions.

Social Learning also related to the self-regulatory capacities which created occasionally from the external influences including;

- Arranging environment
- Generating cognitive support

- Producing consequences for their actions and able to control themselves

Bandura (1997) also highlighted that during the cognitive development, learner gradually develop self-appraisal and metacognitive skills through the exercise of personal efficacy through the improvement of cognitive, social, manual, and motivational skills which “Co-development” is defined as one of the process of perceived efficacy. Socially structured occurred from skills in dissimilar domains are acquired together. Proficient action can be guided by the self-regulatory skills to improve the activity performance.

1.2 Socioemotional Selectivity Theory

As seen from Social Cognitive Theory, developing perceived efficacy before performing behavior is associated with the efficacy expectations from various factors such as performance accomplishments, experiences, and emotional arousal. Later, the social factor is one of the dominant keys for the outcome expectation. One of the life span theory which related to the social motivation is Socioemotional Selective Theory (SST) developed by Carstensen (1992). It has found that social motives fall into 1 of 2 categories which are the acquisition of knowledge and its related to the emotion regulation. The theory also can be divided into 3 presumptions as follows;

- The belief of social interaction as a core to survival
- The engagement of human behavior is guided by the realization of their goal
- People sometimes hold multiple goals and oppose them, the selection of goals leads to action

Carstensen, Isaacowitz, and Charles (1999) have later reported the related of perception of time and age differences related in social goals. The perceived of time

is linked with the selection of social goals. The arguments are that when time is open-ended knowledge-related goals are prioritized while emotional goals seem to be dominant when time is perceived as limited.

Secondly, according to the age differences (Carstensen, Fung, Charles, et al., 2003; Dudley & Multhaup, 2005), It has found that late adolescence (at undergraduate level) and early adulthood trend to acquire knowledge rather than regulate their emotional states, while adulthood consider the selective of social partner that satisfied by the results of “feeling state” with fewer people who known them well in the emotionally meaningful and social networks. Adults were satisfied with the current size (less social network across their life span) rather than wanting larger networks (Lansford, Sherman, & Antonucci, 1998). In summary, Carstensen et al. (1999) has summarized the idealized model of Socioemotional Selectivity Theory in the conception of social motives across the life span presented in figure 7.

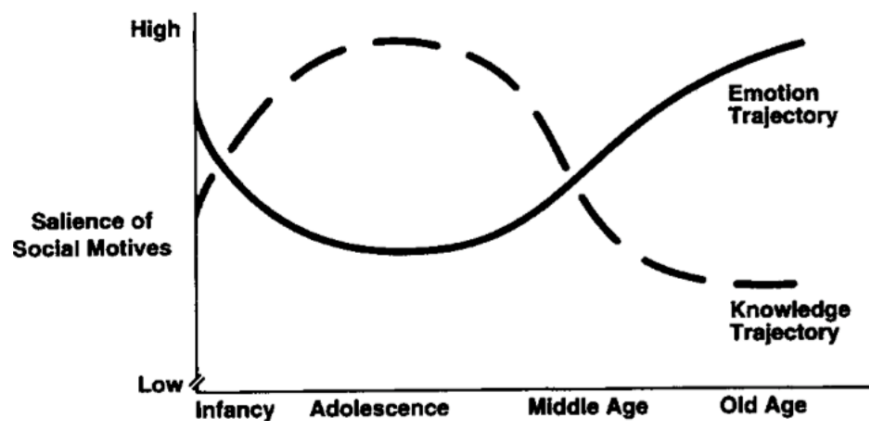


Figure 7 Socioemotional Selectivity Theory's Conception

To bring the empirical findings from Socioemotional Selectivity Theory to the implications, knowledge and emotion related goals considered as an essential element of goal oriented that motivates their social behavior. Cognitive appraisal of time helps balancing between long- and short-term goals. The theory also highlighted the importance of emotion regulation to maintain the emotionally

balanced and meaningful life. Selecting choice of social partners who are familiar to them are one of the key factors in social motives because their emotions will be predictable and often shown as positive.

For college students which time orientation is quite restricted, the highly future-oriented students with highlight on the goal-directed behavior will engage in more activities toward their long-term goals. While older adult increased attention on emotions in everyday life which associated the effects on cognitive functioning merit and social decision-making. Experienced emotions in adulthood are more predictable, less negative, and social roles change quantitatively and qualitatively (Charles & Carstensen, 2010). Overall, motivational changes lead to the representation of social world with emotional ties, and efforts to manage the quality of emotional experience in daily life (Carstensen, Fung, Charles, et al., 2003; English & Carstensen, 2015).

1.3 Social Neuroscience

Humans are social animals; we need social interaction in order to function. The Social Neuroscience is the integration from various disciplines which combines social psychology, philosophy together with the neuroscience. The recent development in evolutionary time, social and behavioral theories were plumbed through the social neuroscience research with the fundamental question whether specific social constructs, processes and representations have a definable neural locus by using functional magnetic resonance imaging (fMRI) and emphasizing the role of frontal cortex, amygdala and somatosensory cortex. (Cacioppo & Berntson, 2005). The empirical finding from the previous studies have reported that human brain is not only process the information but responsible for socioemotional information processing. There is a causal relationship between cognitive and social neuroscience which information processing in cognitive and affective has a close relationship with the operation of specific nervous system circuits.

For social cognitive domain, Adolphs (2003) reveals that the social brain is probing the neural underpinnings of social behavior. The investigation the new links between emotion and reason, action and perception, and between representations of other people and ourselves have been discovered. Moreover, the involvement of social cognition is possible assigned by the set of neural structures in the various stage of information processing as seen in figure 8. Moreover, Amodio (2008) discusses the social behavior at multiple levels of analysis, one of the empirical finding has shown that self-regulation of intergroup responses involves multiple coordinated underlying processes.

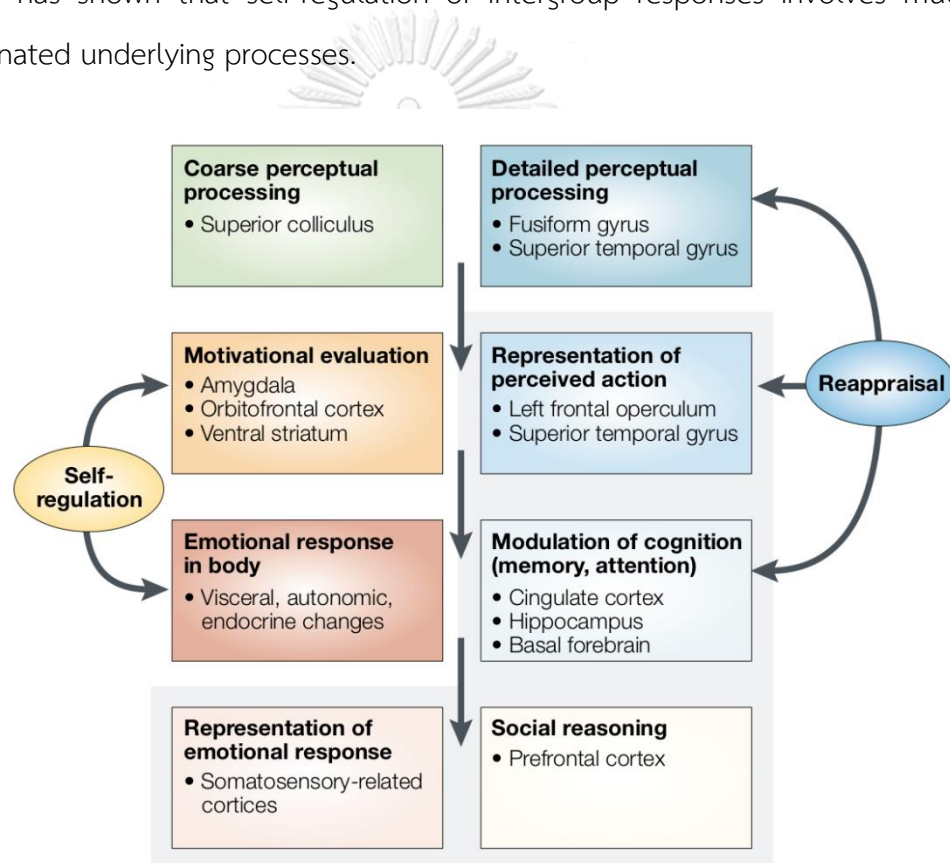


Figure 8 Processes and brain structures involved in social cognition
from Adolphs (2003)

From the emotions domain, Müller-Pinzler, Krach, Krämer, and Paulus (2017) claims that emotions is triggered by the social interaction which human brain experiences interpersonal emotions and makes sense of others' states of mind. Baez, García, and Santamaría-García (2017) mentioned the moral cognition which is arisen

of three components: structured event knowledge (prefrontal regions), social perceptual and functional features (posterior and anterior regions of the temporal cortex), and central motive or basic emotional states (limbic and paralimbic regions) [figure 9] Moreover, the social comparison function in human interaction is revealed with the term “Fortune-of-Other Emotions” (FOEs) which affective stage in responding situations to others is arisen in 2 aspects; the social role of oneself and others favors self-knowledge and self-regulation. The FOEs divided into 4 sub-categories depending on self- and the others, and can be recognized as the empathetic emotions and counter-empathy emotions [figure 10]

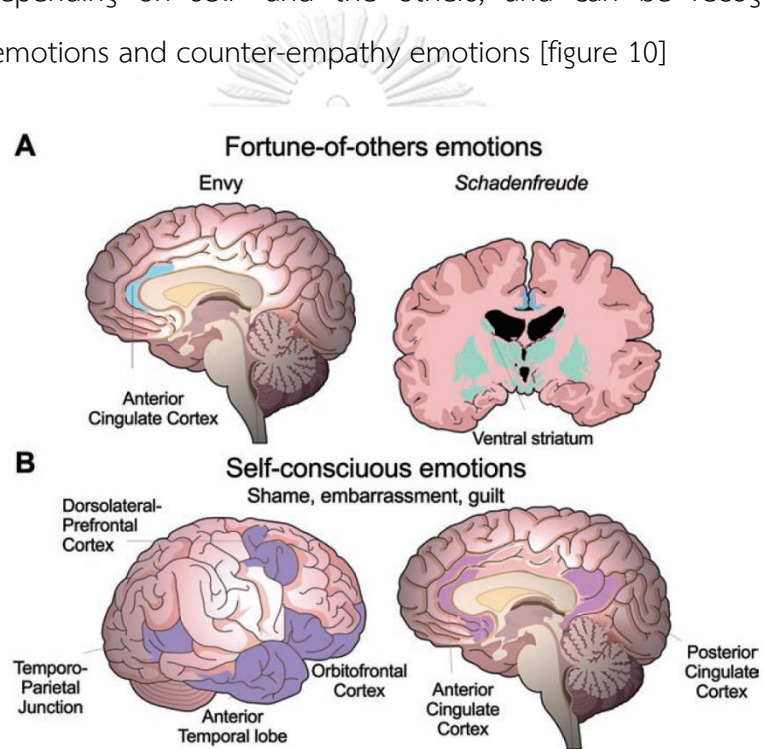


Figure 9 Neural structures involved in the moral emotions
retrieved from Baez et al. (2017)

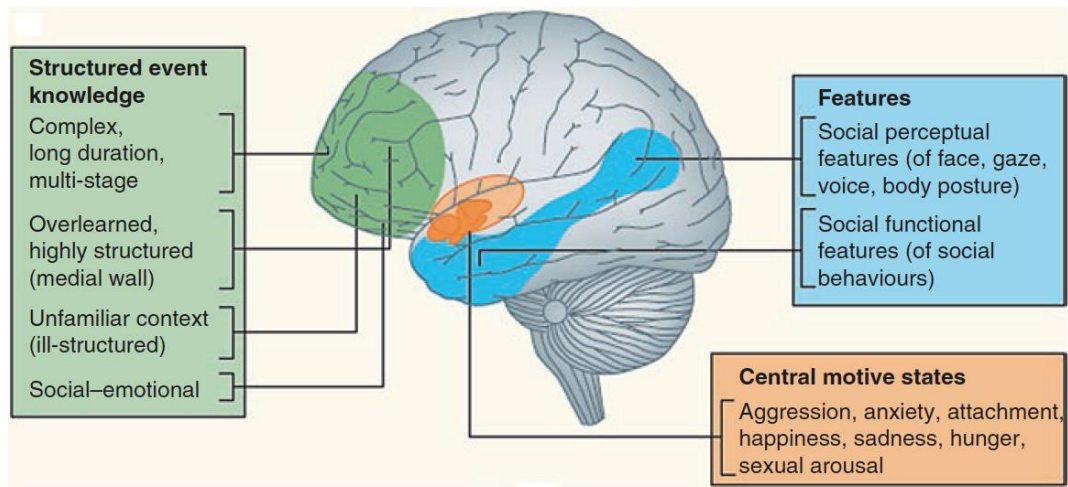


Figure 10 The event-feature-emotion complex model retrieved from Baez et al. (2017)

There have been a number of studies about emotions for instance, Amodio (2014) examined the study of electroencephalography (EEG) in social interactions. Researcher found the influences of signals from the temporal cortex, prefrontal cortex and amygdala to the fusiform gyrus which perception of a face can alter the way of social motivations. Decety and Batson (2009) has divided the examination of the capacity to share and understand other people's such as the influence of empathy factor in various 3 ways including;

- 1) Motor and physiological resonance mediated by the perception-action and the autonomic nervous system that regulates bodily states, emotion and reactivity
- 2) Meta-cognitive abilities to infer or imagine another person's thoughts or feelings
- 3) Emotion regulation modulates negative arousal and adds flexibility

There are some factors related to the social activity such as role taking, group mind, and race between in-group and out-group. Franks (2013) clarified the difference between taking the role of other (role-taking) and theory of mind which role-taking is not only known what others think but experience their own selves from their construction of the other's different cognitive and emotional perspective. Van Bavel, Hackel, and Xiao (2014) applied the context of social cognition with the concept of "group mind" to describe a sense of collective consciousness among humans in group-level. The combination includes factors of bottom-up visual cues (e. g., race) and top-down social motives (e.g., group affiliation). Terbeck (2016) reveal that amygdala reflects emotional processing of social perception such factors as race and in-group – out-group is strongly related to activity in the fusiform gyrus.

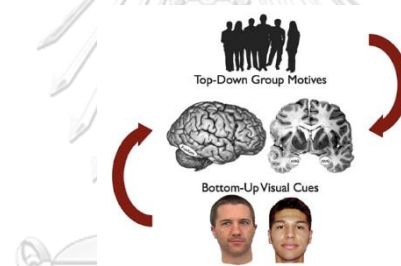


Figure 11 Neural activity in group mind

By drawing on the concept of social neuroscience in the educational practice, the determination of goal-setting, social behavior, and emotion regulation are being used in the research. Pietto, Kamienkowski, and Lipina (2017) pointed out that there is the association between brain structure and childhood poverty, for example, executive functioning (prefrontal cortex), and social-emotional processing (amygdala). Horstkötter (2017) stated the development of prefrontal level and people's ability to suppress emotionally loaded thoughts by supporting children to set and reflect in their goal. Lastly, according to Vrtička (2017), the attachment behavioral system can also be understood as an emotion regulation on learning processes involving extrinsic emotion co-regulation and a subsequent internalization with the self-regulation.

2. Social and Emotional Learning

2.1 Definitions of Social and Emotional Learning

A large and growing body of literature has investigated the development of Social Emotional Learning. The term “Social and Emotional Learning (SEL)” is defined by McKown et al. (2009) as children to engage in socially competent behavior, a large number of cognitive, behavioral, and emotional processes in particularly, encoding, interpreting, and reason about social and emotional information. Social-emotional competence is significantly has a direct effects on school connectedness and mental health difficulties (Panayiotou, Humphrey, & Wigelsworth, 2019).

Collaborative for Academic (2017) defines Social and Emotional Learning as

“the process through which children, youth, and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions”

While, the organization for Economic Co-operation and Development – OECD (2019) defined the social and emotional skills as the ability to regulate one thoughts, emotion, and behavior. Social Emotional Skills is different from the cognitive ability such as literacy because it’s more emphasizing on the way that people manage their emotions, perceive themselves and engage with others rather than indicating their own raw ability. However, they are both rely on the situational factors and responsive to the change and development.

In summary, the term Social and Emotional Learning van be defined as the ability to apply knowledge, attitudes, and skills to achieve positive goals by regulating behavior and emotions both in oneself and socially behavior.

Social and emotional learning is used as the umbrella term for a wide range of competencies including emotional intelligence, social competence, and self-regulation (S. M. Jones, Bouffard, & Weissbourd, 2013). The following are the examples of competencies related SEL: emotional processes, social/interpersonal skills, cognitive regulation detail presented in table 1.

Table 1 competencies related to SEL

Competencies	Description
Emotional processes	<ul style="list-style-type: none"> . Understanding and labeling feelings accurately; regulating emotions and behaviors . Taking another's perspective, displaying empathy
Social/interpersonal skills	<ul style="list-style-type: none"> . Understanding social cues (such as body language and tone of voice); . Interacting positively, offering help
Cognitive Regulation	<ul style="list-style-type: none"> . Maintaining attention and focus; engaging working memory, . Shifting gears when needed (e.g., trying a new approach)

There are support evidence by the principals' perspective survey on SEL in the US, Matthew N. Atwell (2019) reported that 79% percent of principals believed that teaching SEL will have long-lasting benefits that continue through after graduation and becoming good citizens as adults. Social and Emotional Learning is not only benchmarked among the students' group. There are several parts continue to use this framework through the development of early adulthood to late adulthood (Denham, 2018; Grysole, 2009; Jenny Nagaoka, 2015) for example, the Rhode Island, Wisconsin, and Tennessee (Dusenbury, Yoder, Dermody, & Weissberg, 2019) which SEL related to the executive functioning factors such as motivation, time

management, and self-regulation which the sub-skillset is crucial for later life outcomes including success in the labor market. For all adults, some of SEL skills come naturally, while others require ongoing development effort (S. M. Jones et al., 2013).

The social-emotional model is widely use across the nation and international such as New York State Education Department (2018) has a mission to raise the knowledge, skill, and opportunity for all people, they prepare the people for college, career, and responsible citizenship in the 21st century. According to Denham (2018) meta-analysis's study, researchers revealed the results according the social and emotional learning as follows:

- 1) Better academic performance
- 2) Improved attitudes and behaviors
- 3) Decrease negative behavior such as noncompliance, aggression
- 4) Reduced emotional distress such as stress, depression, social withdraw

2.2 Social and Emotional Learning Frameworks

There is a large number of frameworks describing the Social and Emotional Competencies. Surveys on the taxonomy project conducted by S. Jones, Bailey, Brush, and Nelson (2019) have shown that there are more than 16 frameworks related to the field of Social and Emotional Learning and continued to increase. Some issues to consider when selecting and using Social and Emotional Frameworks. Berg, Nolan, Yoder, Osher, and Mart (2019) stated 3 different sociocultural contexts to consider which are 1) the culture, racial/ethnic diversity, and inequality 2) the adversity and trauma, ages.

Several studies have defined the definition of social-emotional competencies and its competences as follows; Weissberg, Durlak, Domitrovich, and Gullotta (2015) published a conceptual model of systematic social-emotional learning in the

educational setting including: self-awareness, self-management, social awareness, relationship skills, and responsible decision making, framework presented in [figure 12]

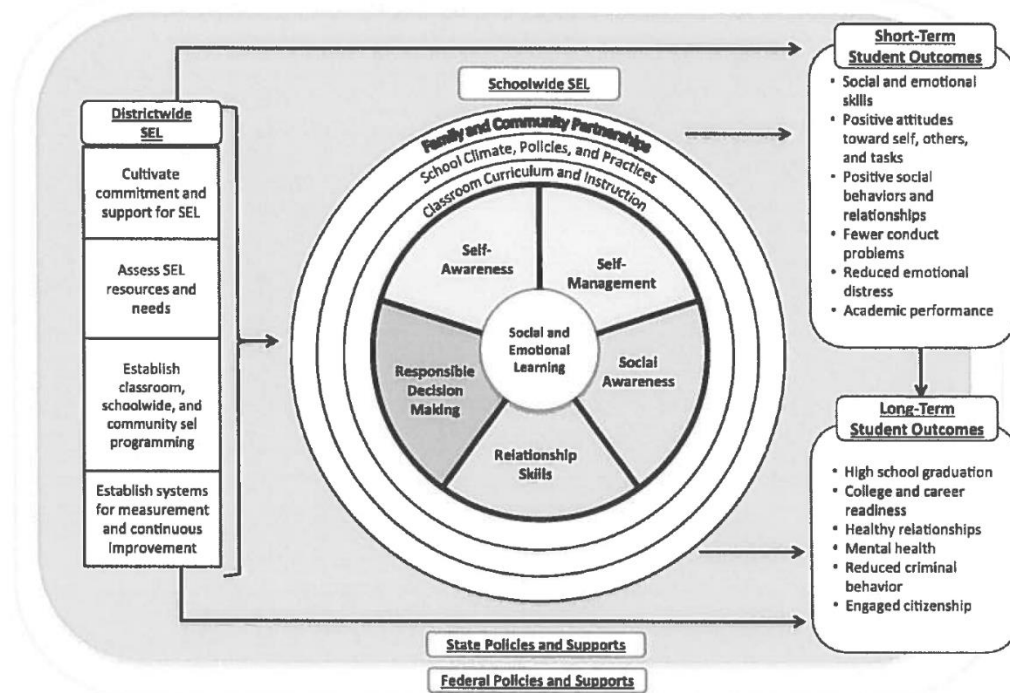


Figure 12 A conceptual model of systematic SEL in educational setting

Social and Emotional Learning also defined as the comprehension. According to McKown's research, Social and Emotional Comprehension is consequential and rather have children to demonstrate skills by themselves. The key factors are emotional recognition, social perspective-taking, social problem solving, and self-control. SEL web are illustrated and narrated with pictorial faced-choice responses which are used to assess Social and Emotional Comprehension (McKown, 2018, 2019; McKown et al., 2013; McKown et al., 2009), framework presented in [figure 13].

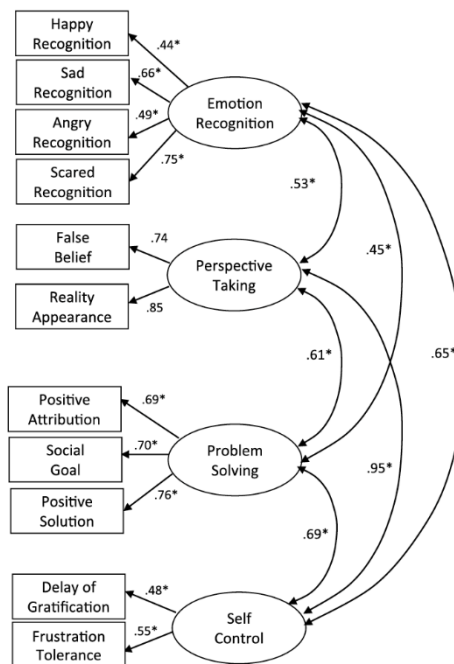


Figure 13 Four factor model for social-emotional comprehension

The SHLS framework is classified by International Rescue Committee (2016) which Social and Emotional Learning is divided into 5 specific competencies including: brain building, emotion regulation, perseverance, conflict resolution, positive social skills. In the same year, MESH framework as developed by (California's CORE Districts, 2016) has been introduced with 4 competencies to transforming education in partnership with California's CORE districts including: growth mindset, self-efficacy, self-management, and social awareness.

Later, the Social and emotional learning (SEL) Competencies has been introduced by the (Collaborative for Academic, 2017). The CASEL competency framework developed by the Collaborative for Academic, Social, and Emotional Learning is the most cited framework for Social and Emotional Learning. The framework revealed the relationship between 3 domains which are the classroom setting expanding to the schools, home, and the community's level. The social and emotional learning competencies comprise 5 domains of category; self-awareness, self-management, social awareness, relationship skills, and responsible decision making, framework presented in [figure 14]

At self-level, self-awareness is the ability to recognize one's own emotions, thoughts, and values as well-grounded from the growth mindset. In self-awareness, learner need to recognize their own emotions, accurate self-perception, recognize strengths, develop a self-confidence and self-efficacy. Self-management is the ability to regulate and control oneself to set and work toward personal and academic goals. The components for self-management are impulse control, stress management, self-discipline, self-motivation, goal setting, and organizational skills.

At social-level, social Awareness is the ability to take the perspective of and empathize with others, understanding of social and ethical norms which students may perspective-taking, empathy, appreciating diversity and respect for others. Whilst, relationship skill is the ability to maintain relationships with others and groups and to communicate clearly, listen well, cooperate with others, and seek and offer help when needed. Lastly, responsible decision making is the ability to make constructive and the realistic evaluation of consequences of various actions of oneself and others by identifying problems, analyzing situations, solving problems, evaluating, reflecting and responsible for the ethical.



Figure 14 A Social and emotional learning (SEL) Competencies

There is another aspect that point out the perspective on teacher Social and Emotional Skills from Esen AygÜN and Sahin Taskin (2017) who conducted the study on the investigated of teachers' knowledge about social-emotional skills, teachers' belief and social-emotional learning. In this study, a survey of teachers' perspective in social-emotional skills on the Social-Emotional Learning program in Turkey is acquired. The results indicate that although some of the teachers may know about the concept of social-emotional learning, however, they couldn't give much among its details. So that teachers should be informed about this topic and should implement the educational and social development program. The competencies used in the survey is aligned with the CASEL framework.

Carmel Cefai (2018) brought the integration of social and emotional education as a core component of curricula across the EU. The NESET framework identifies the key competences of social and emotional education including 4 competencies: self-awareness, self-management, social management, and social awareness. Another interesting framework is the range of measures to assess executive function (EF) and other regulation-related skills in Executive Function Mapping framework (Rebecca Bailey, 2018). Researcher coded the terms/skills over 45 different terms and revealed the synthesis of competencies as follows: cognitive self-regulation (executive functioning), emotional functioning, emotional and behavioral self-regulation, relationships with adults, relationships with other children, and attending and understanding.

The past OECD studies such as the PISA and PIAAC indicated the important of increasing social emotional skills as the meaningfully within and across cultural and linguistic boundaries. The study of OECD (2019) draws the Big Five Model to conduct the social emotional survey. These 5 categories which can be split and narrower into the lower order. The 5 categories are as follow; the openness to experience (open-mindedness), the conscientiousness (task performance), the emotional stability

(emotional regulation), the extraversion (engaging with others) and the agreeableness (collaboration) framework presented in [figure 15].

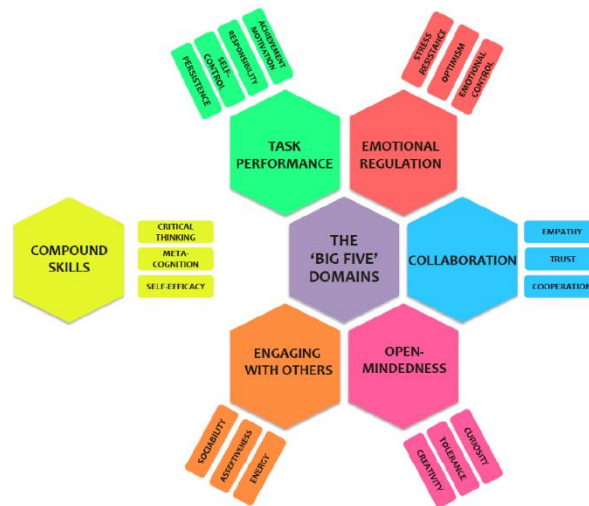


Figure 15 The 'Big Five' Domains

The SEE framework (Social Emotional and Ethical Learning (SEE Learning), 2019) is designed for K-12 classrooms around the world. Apart from classroom setting, researcher also claimed that the framework can be used for all levels of education, including higher education and professional learning. The competencies comprise attention & self-awareness, self-regulation, self-compassion, appreciating interdependence, recognizing common humanity, community & global engagement, interpersonal Awareness, compassion for others, and relationships skills, framework presented in [figure 16].

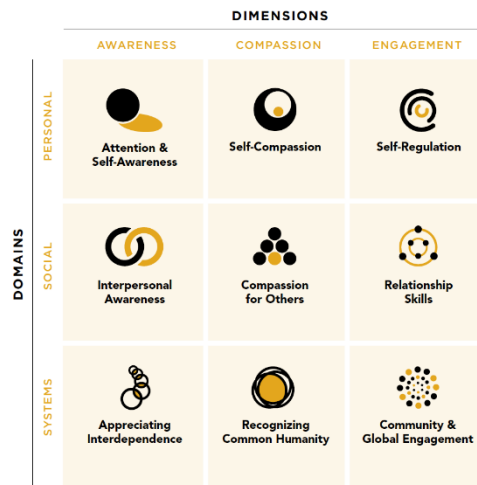


Figure 16 The SEE learning framework

The summarize of the social-emotional model falls into 2 categories which are the self-level and at the social-level. CASEL framework is the most widely used which found in (Collie, Martin, & Frydenberg, 2017; Crowder, Gordon, Brown, Davidson, & Domitrovich, 2019; Minnesota Department of Education, 2018); Weissberg et al. (2015) The others remains consistent with the CASEL model. To clearly understand about the social-emotional learning, this study synthesis the social-emotional model as appeared on the [table 2].

2.1 Social and Emotional Skills

There are many taxonomies that related to the Social and Emotional Learning. Most of the taxonomies related to ability to apply knowledge (cognitive), attitudes (affective), and skills to achieve positive goals (behavior). It can be classified as the self- and social- level. On [table 3], we present a synthesis of the competencies classified among different models and framewor

Table 2 A Synthesis of Social and Emotional Learning models and frameworks

Frameworks	Social-Emotional Learning Skills	SHLS	MESH	CASEL	Teacher Social-Emotional Skills	NESET	The Big Five Domains	SEE	Executive Function Mapping
Founder	(McKown et al., 2009)	(International Rescue Committee, 2016)	(California's CORE Districts, 2016)	(Collaborative for Academic, 2017)	(Esen Aygün & Sahin Taskin, 2017)	(Carmel Cefai, 2018)	(OECD, 2019)	(Social Emotional and Ethical Learning (SEE Learning), 2019)	(Rebecca Bailey, 2018)
Institution	-	Safe Healing and Learning Space (SHLS)	Transforming Education in partnership with California's CORE Districts	The Collaborative for Academic, Social, and Emotional Learning (CASEL)	-	NESET, European Commission	Organization for Economic Co-operation and Development (OECD)	Center for Contemplative Science and Compassion-Based Ethics at Emory University	Harvard Graduate School of Education
Age	Ages 4 to 17 years	Grade 6-12	K-12	PreK-12	-	Early childhood, school age child, adolescent	Ages 10 and 15 year-old students	K-12, higher, and professional education	Ages 1-18+
Context	Typically Developing and Clinic-Referred Children	Primary school into high school	School in CA CORE Districts	Classrooms, Schools, Homes and Communities	Primary teachers' social-emotional learning and social-emotional learning programs in Turkey	School	School	School	-
Domain	-	Mindsets, Essential Skills, and Habits (MESH)	Self-curriculum and instruction Schoolwide practices and policies Family and	Curriculum, Climate Early intervention, Targeted interventions, Student voices,	Social and Emotional Skills Cognitive Skills Outcomes	Personal, Social, System	Approaches to Learning Social and Emotional Development Language and		

Frameworks	Social-Emotional Learning Skills	SHLS	MESH	CASEL	Teacher Social-Emotional Skills	NESET	The Big Five Domains	SEE	Executive Function Mapping
				Community partnerships	Teachers' competence and own wellbeing, Parental collaboration, Quality implementation and adaptation -				Communication
Measurement Tools	Found later in (McKown, 2018)	Not provided	Student self-report (grades 5-12) Teacher-report surveys	Compendium of pre-K and elementary social and emotional learning measures	Not provided	Not provided	Not provided	Not provided	Synthesis of Measurements By Age By Skill Complexity By Domain By Measurement Strategy
Guide for Measurements	Using SEL-web assessment-	Provide activity and training resources	To guide district accountability	Provide examples of SEL measures used by school districts	-	Suggest formative assessments to monitor, evaluate, and improve student learning	Describes the types of measures typically used to measure social and emotional skills	Provide informal assessments, including student self-assessment, class assessment, and educator self-assessment	-

Table 3 A Synthesis of the competencies classified among different SEL models and frameworks

Competencies		Learning Skills (McKown et al., 2013; McKown et al., 2009)	SHLS (International Rescue Committee, 2016)	MESH (California's CORE Districts, 2016)	CASEL (Collaborative for Academic, 2017)	Teacher Social-Emotional Skills (Esen Aytün & Sahin Taskin, 2017)	NESET (Carnel Cetai, 2018)	Executive Function Mapping (Rebecca Bailey, 2018)	The Big Five Domains (OECD, 2019)	SEE (Social Emotional and Learning) (SEE Learning), 2019)
Self-level	Social-Emotional Learning Skills	• Emotional Recognition	• Brain Building	• Self-Efficacy • Growth Mindset	• Self-Awareness	• Self-Awareness	• Self-Awareness	• Cognitive Self-Regulation (Executive Functioning) • Emotional Functioning	• Open-mindedness • Task Performance	• Attention & Self-Awareness
		• Self-control	• Emotion Regulation • Perseverance	• Self-Management	• Self-Management	• Self-Management	• Self-Management	• Emotional and Behavioral Self-Regulation	-	• Self-Regulation • Self-Compassion
Social-level	Social Problem Solving	• Social Problem Solving	• Conflict Resolution	-	• Responsible Decision Making	• Decision-Making	-	-	• Collaboration	• Appreciating Interdependence • Recognizing Common Humanity • Community & Global Engagement
		-	• Positive Social Skills	-	• Relationship Skills	• Ability to Establish Relationships	• Social Management	• Relationships with Adults • Relationships with Other Children	• Engaging with Others	• Interpersonal Awareness • Compassion for Others • Relationships Skills
	Social Perspective-Taking	• Social Perspective-Taking	-	• Social Awareness	• Social Awareness	• Social Consciousness	• Social Awareness	• Attending and Understanding	-	-

There are some researchers defined the Social Emotional Learning as the sub-competencies such as Character Lab (2020) set of interpersonal, intrapersonal, and intellectual character strengths that benefit the self and others. The competency includes curiosity, gratitude, grit, growth mindset, optimism, purpose, self-control, social/emotional, and zest.

From the literature review, we have found that domain focus from various frameworks are all corresponded to the CASEL framework. The CASEL can be used as the universal interventions are embedded into a wide range of supports for example the SEL instructional practice, the service-learning opportunity, extra-curricular, peer tutoring and mentoring program. The framework is widely used for all young people and adults cross the country. In order to achieve the goal, we adopted the CASEL framework, CASEL consists of 5 core competencies which are the self-awareness, self-management, social awareness, relationship skills, and responsible decision making. However, we have classified the sub-skills in each competency to present the relationship between person — behavior, environment, and cognitive factors. We have found that the sub-skills of SEL are related to the cognitive self-regulation, emotional self-regulation, behavioral self-regulation, and socially-shared regulation concepts ranged from self- to social- level and perception (input) to action (output) respectively [table 4].

Table 4 A Synthesis of the SEL sub-skills and self-regulatory factors

	Person		Behavior	Environment
	Cognitive Self-Regulation	Emotional Self-Regulation	Behavioral Self-Regulation	Socially-Shared Regulation
Self-Awareness	<ul style="list-style-type: none"> •Accurate self-perception •Recognizing strengths •Self-efficacy 	<ul style="list-style-type: none"> •Identifying emotions •Self-confidence 		
Self-Management	<ul style="list-style-type: none"> •Impulse control 	<ul style="list-style-type: none"> •Stress management •Self-motivation 	<ul style="list-style-type: none"> •Self-discipline •Goal setting •Organizational skills 	
Responsible Decision Making	<ul style="list-style-type: none"> •Identifying problems •Analyzing situations •Reflecting 	<ul style="list-style-type: none"> •Ethical responsibility 	<ul style="list-style-type: none"> •Solving problems •Evaluating 	
Social Awareness		<ul style="list-style-type: none"> •Empathy 	<ul style="list-style-type: none"> •Respect for others 	<ul style="list-style-type: none"> •Perspective-taking •Appreciating diversity
Relationship Skills			<ul style="list-style-type: none"> •Relationship building 	<ul style="list-style-type: none"> •Communication •Social engagement •Teamwork
	Perception (input)			Action (output)

Self-
Social

2.4 Social-Emotional Development

Dusenbury et al. (2019) conducted the exploration on the Social Emotional Framework used in United State that reflected in K-12 learning standards using three different efforts to compare the frameworks; the Harvard Taxonomy Project is used to compare the words in different frameworks, the American Institutes for Research (AIR), and the brief of CASEL standards guideline. With the following research questions; what SEL framework does the state using, has the state developing benchmarks and others priorities and approaches. A number of states that used the SEL learning standards are now increasing. At the end of 2018, there are 14 states are articulated K-12 standards for social emotional learning. It appeared that 10 out of

the 14 states use the CASEL 5 core competencies framework while 4 of 14 use a state-specific framework that does not directly align to CASEL, however, it is in the line with the five core competencies in a slightly different way. This study analyzed how each state's K-12 learning standard is aligned with the CASEL. The findings also revealed the 6 connections from the CESL to the priorities and approaches in the collaborating states initiative which consist of the academic integration, the mental health and well-being, the whole child development, the workforce readiness, college and career readiness, the school climate and culture, the character education and development, and the multitiered systems of support. Lastly, the paper concludes the expected number of states that will produce more guidance for equity and cultural responsiveness.

In learning activity, there is the study of relationships between students' social-emotional competence and mathematics academic development which high SEC reflects self-confidence, mathematics interest but low level of mathematics anxiety significantly (Z. Yang, Wang, & Zhang, 2019). Splichal, Oshima, and Oshima (2018) suggest that information supports to facilitate socio-emotional regulation for first-year university students collaborative digital portfolio activity.

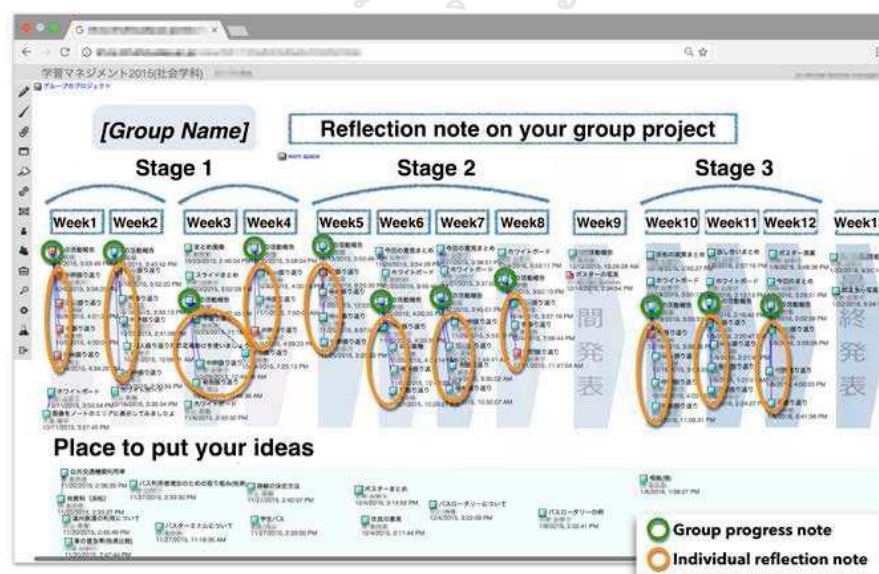


Figure 17 Knowledge Forum in Group Project (Splichal et al., 2018)

Although most of Social and Emotional development occurred through the K-12 levels, it has been found that young adulthood approximately spans the ages between 20–40 years also needs to continue to develop SEL within three anchors (Hutchison, Wagner, & Leigh-Osroosh, 2016):

- 1) Sense of who we are we desire to share our experience and relationships with others
- 2) Experiences that can challenge values, and to expand the perspectives
- 3) Flexibility that leads to accepting the diversity of values and balancing relationships.

Saxe (2011) found that developing Emotional and Social Competence of school leaders can predict the transformational leadership in school reforms efforts and positive school outcomes.

For teacher education, Jennings and Greenberg (2009) proposed the prosocial classroom which teacher social and emotional competence is highlighted to be a socially and emotionally competent teachers. Therefore, social and emotional competence may serves as teachers' successfully navigate expectations which enable them to reflect on social emotional learning and self-assess in the instructional practices become an integral part of high-quality teaching and learning Tom (2012); Yoder (2014). Moreover, the social-emotional program helps to increase teachers' classroom management, develops teacher-student relationships and aims at the increasing of students' social skills (Esen AygÜN & Sahin Taskin, 2017). Hen and Goroshit (2016) revealed that the number of researches on the development of teachers' social–emotional abilities are still limited

There are some of the broad concept linking between self-regulation processes can be applied to develop social-emotional skills. This can be seen in

McKown et al. (2009), the more children developed their regulation processes, the more they increased measures of social-emotional skills.

2.5 Social and Emotional Measurements

Riggs, Greenberg, Kusché, and Pentz (2006) conducted the study of neuropsychology development model to promote the social competence and prevention of problem behavior. The research question aimed to identify whether the investigation on mediation of the inhibitory control and verbal fluency with the program condition and teacher reported externalizing and internalizing control. The regression analysis was used to test the empirical support and the effective of the universal school-based prevention curriculum named PATHS Curriculum. The findings suggest that the design of curricular to promote social-emotional is necessary for the executive functioning, verbal processing, and emotional awareness development. The significant of the neurocognitive functioning and its development could be used to develop a program that bring the theoretical perspective to the implications in real setting.

McKown et al. (2013) examined the clinically interpretable tools to assess children's social-emotional comprehension. As children social-emotional comprehension is a part of social assessment, researcher concluded that the prior research suggested that the more developed social-emotional comprehension, the more children will increase their social interactions and better in peer relationships. However, it is still lack of the assessment tool to assess specific social-emotional comprehension in the clinic utility. A total number of 174 general school sample (kindergarten through eight grade) and 119 clinic sample were used to examine the individual assessment, composite scores and direct assessment. The features of prominent theory, called Social Emotional Learning Framework (SELF) were extracted. These are including Social neuroscience, social information processing, affective social competence, and emotional intelligence. The core measure that

researchers used to conduct the research is based upon these key factors; Social Awareness, Social Meaning, Social Reasoning.

The results revealed that individual assessments are well-validated strategies with the excellent reliability of the factor scores. Further research should investigate the intervention strategies that help children develop social-emotional comprehension.

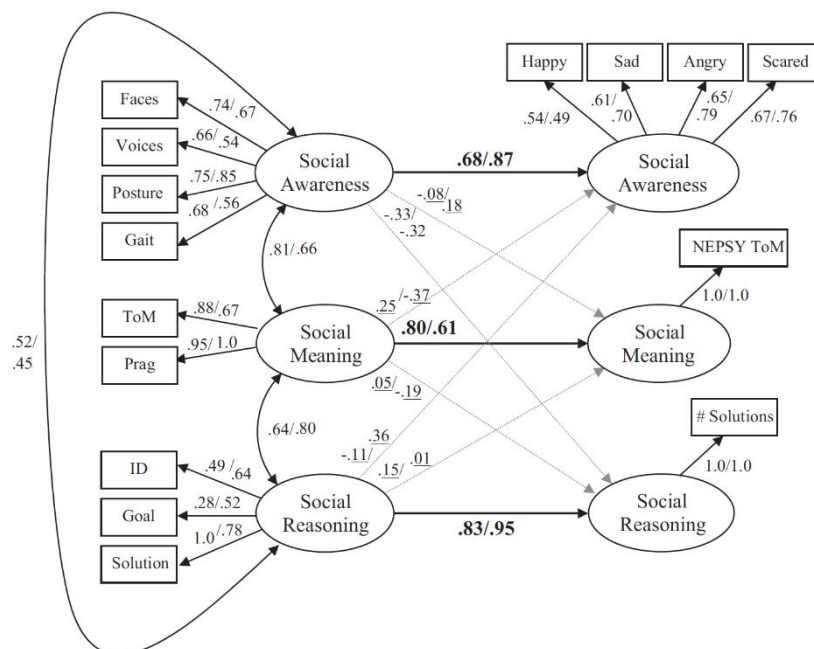


Figure 18 Children’s social-emotional comprehension assessment model

McKown (2017) has thrown up the idea of assessing Social-Emotional Learning (SEL). Since there were a small volume of existing research which have high quality assessment SEL. The need to develop the high-quality assessment need to be usable, feasible, and scalable. People used to interact with social in order to achieve the social goals. Thus Social-Emotional Learning (SEL) is labeled as a soft skill or noncognitive skill which used to infer others’ thoughts and feelings including

thinking skills, behavioral skills, and self-control skills. One of the standards used for SEL such as the Collaborative for Academic Social and Emotional Learning (CASEL) which is related to Noncognitive factors (Academic perseverance, academic mindsets, learning strategies, and social skills) and in the line with 21st century skills in both on self-management skills and interpersonal or people skills. Vary scholars emphasized SEL on cognitive, emotional, and social/interpersonal skills.

Later on McKown (2018) developed the scale assessment for SEL skills. McKown tried to propose the SELweb as a tool to assess SEL from kindergarten to third grade. Together, emotion recognition, perspective taking and problem-solving are the key to develop positive academic and social outcomes. The Quantitative research was tested by conducting multigroup CFA analyses. 4,419 children from 20 schools in the five states were recruited for the stud. The mean age was 7.5 years. The results showed that four-factor model of social-emotional comprehension was fitted the SEL web observed scores.

Minnesota Department of Education (2018) provide the guideline for the assessment guide for the social and emotional learning. The assessment of social emotional learning should be contextualized into the understandings' development of SEL and the development of improving the SEL-related instruction and programming. The assessment of SEL could be best used for the formative assessment such as the information gathering and communications, not for summative assessment or student placement and disciplinary referrals. The stakeholders at all levels of education system will benefit from the assessment. Th district leader can examine the data to find the implementation of outcome and trends. The school leader can use data to identify the trends, different types of students' support and the teachers practice. The model of SEL assessment divided into multiple methods; questionnaire/surveys (student self-reports, teacher report, process measure), observations, performance assessments, report card, and the interview or focus group. There are 2 types of SEL assessment which are the

outcome measures and process measures. The outcome measures emphasize on the goal of the effort through self-report, teacher report, family report and the tasks performance. The process can be measured through the practices during the effort through the observations, self-reports, teacher logs or student reports of teacher practice. At the individual level the assessments should be conducted in the formative purposes e.g. teacher may observe students when they are monitoring their progress towards goals. Self-reflection can be used to identify the strategies to follow. Lastly, screening and diagnostic purposes is can be used in a more summative assessment way.

Crowder et al. (2019) proposed the validity of 40-item Social-Emotional Competency Assessment. The research design emphasized on the researcher-practitioner partnership working together to develop a student self-report. The participants form students who took the climate surveys in grade 5,6,8 and 11 during 2015-2016 survey year. As a part of a multidistrict evaluation of SEL initiatives the study received 7,268 in 2015 and 7,490 in 2016. SEC framework is widely used to develop academic success, when students can manage their own emotions and maintain the positive relationships, they tend to engage in their school and better adjust and excel academically. The definition of five domains according to the CASEL's framework includes; self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. This also reflected the psychological and educational research and its related to emotion regulation, problem solving and self-regulated learning. The results presented 95% confidence intervals of item locations which can be concluded that the 40-item WCSD-SECA can be used in practice and research. Future research suggests the test of latent competency dimensions both in general and for particular subgroups with this similar method.

3. Grit

3.1 Definitions of Grit

Grit is a noncognitive trait, the term grit refers to the perseverance and passion for long-term goals (Angela L. Duckworth et al., 2007). Thaler and Koval (2015) describe grit as the individuals with “guts, resilience, initiative, and tenacity”, which "Gritty" people will learn to embrace uncertainty, and ultimately triumph over adversity and setbacks. Past research showed that grit is highly correlated with the Big Five Conscientiousness goals (Angela L. Duckworth et al., 2007), the tendency to pursue long-term goals predicts achievement in academic, vocational, and avocational domains achievements in socio-cognitive aspect when peer norms aligned with the messages of the intervention (Jiang et al., 2019; Park, Yu, Baelen, Tsukayama, & Duckworth, 2018; Peña & Duckworth, 2018; Yeager et al., 2019), and implicit belief that intellectual endowments, growth mind-set (Dweck, 2008).

For the determinants of grit, it has been found that there are many factors that involved grit such as the durable of desire, education attainment, environments, ages. As seen from (2014) the durable desires, values, goals and preferences rather than momentary wants and needs. Among adults, the Grit-S was associated with educational attainment and fewer career changes (Angela Lee Duckworth & Quinn, 2009). Werner, Milyavskaya, Klimo, and Levine (2019) stated that grit has been proposed as a higher order personality trait that is distinct from other self-regulatory constructs rather than mitigating daily temptation. As the personality and self-regulation, there has been the overlapping between grit, self-control (have-to), and conscientiousness (want-to) [Fig 19] School environments is emphasized the value of learning for learning's which will encourage children to sustain interest in the effort toward long-term goals. (Park et al., 2018). The ages matter is another determinants which relative and absolute age on the Grit subscales scores. (Peña & Duckworth, 2018)

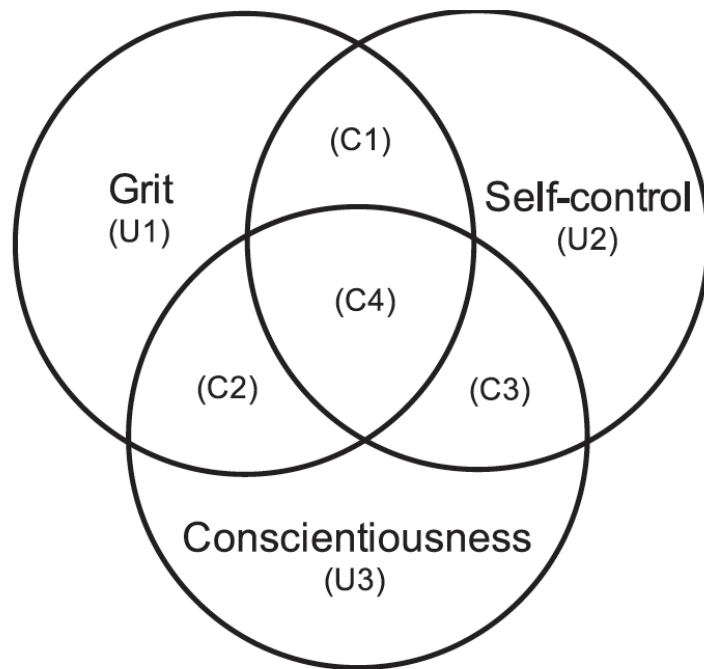


Figure 19 The total variance of grit in academic

There are several studies revealed the effects of using treatments on grit e.g., the success of residents in pursuing additional postgraduate year-one pharmacy training group which they received higher score in overall Grit (Park et al., 2018). Grit is also considered as a determinant of e-learning systems success that grit has positive effects on satisfaction and in students' individual performance (Aparicio, Bacao, & Oliveira, 2017). In sports, Cormier, Dunn, and Causgrove Dunn (2019) reported significantly higher grit in sport than in school and life in general.

3.2 Grit and Social-Emotional Learning

Social-emotional learning may have a potential impact on grit, the integrally relationship to grit is self-management, one of five core SEL competencies which can be taught (The Second Step SEL Program, 2017). Moreover, Gulbrandson (2016) revealed the relationship between emotion-management skills and grit to be reduced negative emotions, and able to manage emotion effectively. This will help when they encounter barriers to their goals. Self-control and grit are sometimes used interchangeably however, both self-control and grit entail aligning actions with

intentions, they operate in different ways and over different timescales. (A. Duckworth & Gross, 2014), [fig 20] showed that when a particular lower-order goal or action is blocked, new goals or actions are generated and then pursued with vigor.

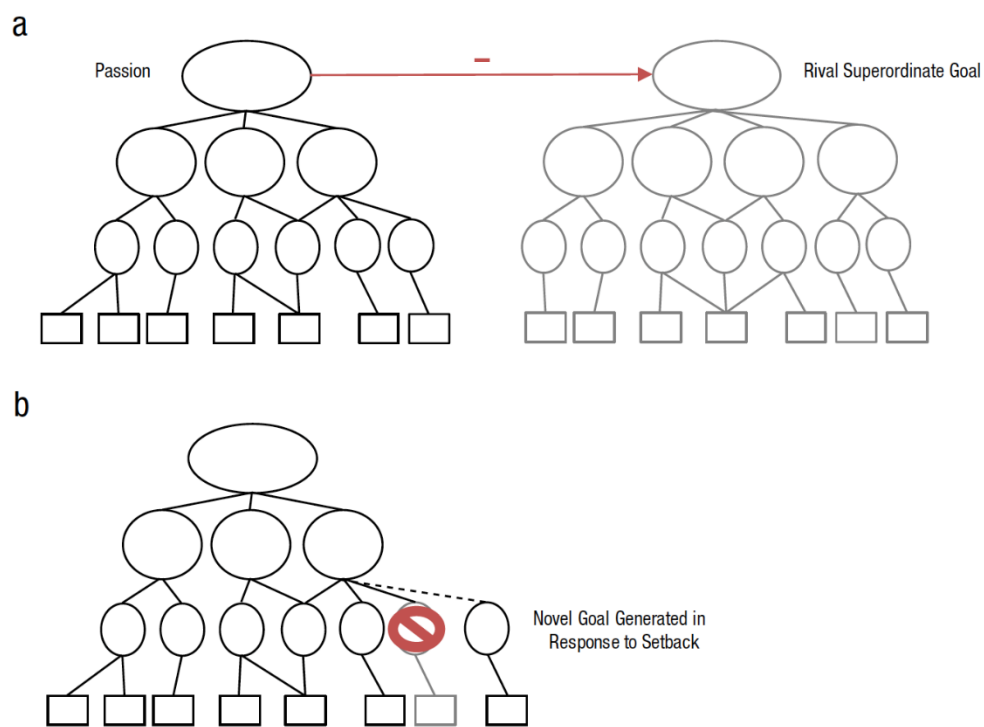


Figure 20 Schematics illustrating processes underlying grit.

3.3 Grit Scale

Most of the recent research used the self-report grit-scale to measure grit. The original of the 12-item Grit scale with the consistency of interest and perseverance of effort is developed by (Angela L. Duckworth et al., 2007). Later, researcher have developed the short Grit Scale (Grit-S) of 8 items for adults aged 25 and older which retain the 2-factor structure of the original to measure trait-level perseverance and passion for long-term goals (Angela Lee Duckworth & Quinn, 2009).

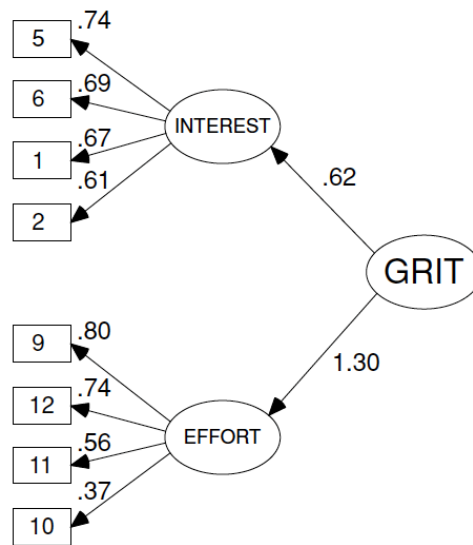


Figure 21 Standardized factor loadings for the second-order model of grit short scale

The Likert-scale is ranging from very much like me, mostly like me, somewhat like me, not much like me, not like me at all. The 8 questions are following:

1. New ideas and projects sometimes distract me from previous ones.*
2. Setbacks don't discourage me.
3. I have been obsessed with a certain idea or project for a short time but later lost interest.*
4. I am a hard worker.
5. I often set a goal but later choose to pursue a different one.*
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.*
7. I finish whatever I begin.
8. I am diligent.

Another development of grit scale from (Datu, Yuen, & Chen, 2017), researcher developed the validation of the Triarchic Model of Grit Scale (TMGS) adapted from the original grit theory which consists of 11 items. The variances used in this grit scale are the perseverance of effort, consistency of interests, and adaptability to situations.

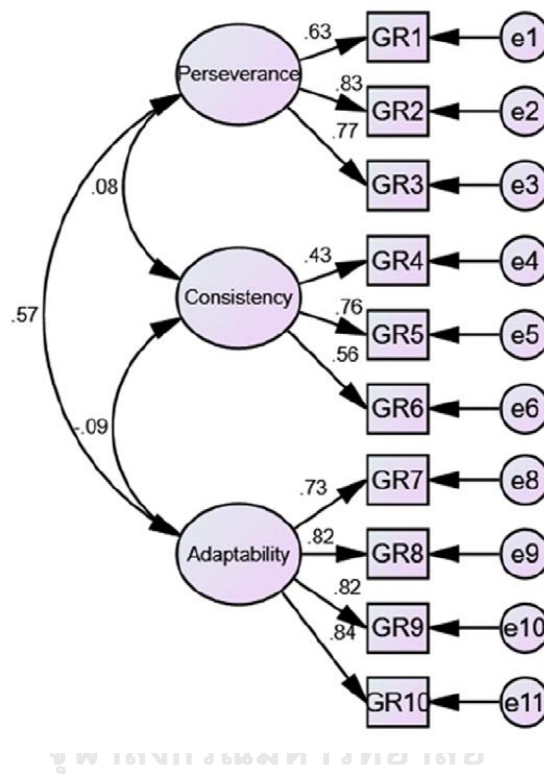


Figure 22 Standardized factor loadings for the second-order model of TMGS grit scale

Lastly, the high internal consistency reliability and construct validity of the academic Grit Scale. The self-report scales measured the academic grit, grit, academic achievement, life and school satisfaction. 11 items wit 5-point scale is used to measure adolescents' grit specifically within academics (Clark & Malecki, 2019)

4. Self-Regulation

4.1 Self-Regulation Theory

Self-regulation learning consists of three keywords, namely Learning, which means activities in the pursuit of knowledge and development of governance skills. Regulation is the examination of work in the current state with the goals set, such as learning goals. Self means the context of achieving one's personal goals. Therefore, self-regulation learning means the acquisition of knowledge and skills. From self-navigation under the motivations. The students can set goals and their own learning strategies in order to achieve the main goals by relying on periodic self-assessment, comparing the current work and strategies with the goals set and adjust strategies as appropriate (Hall & Goetz, 2013)

Many psychologists have defined the self-regulation learning model. Hall and Goetz (2013) has summarized the self-regulation learning-related model that has been presented in the table.

Table 5 self-regulation learning-related model

Model	Authors	Emphasize
<i>Three-Layered Model of Self-Regulated Learning</i>	(Boekaerts, 1999)	hierarchy
<i>Model of Adaptable Learning</i>	(Boekaerts & Corno, 2005)	pocess
<i>Process-Oriented Model of Metacognition</i>	(Borkowski, Chan, & Muthukrishna, 2000)	process

4.2 A Synthesis of Self-Regulation Model

In this study, apart from the above model, Panadero (2017) studies the expansion of self-regulation models, we have picked the most cited models which

are Phases and Subprocesses of Self-Regulation of Zimmerman and Campillo (2000), General Framework for Self-Regulated Learning of Pintrich (2000), and Model of Adaptable Learning of Boekaerts and Corno (2005) respectively shown on table 6.

Table 6 The most cited model of self-regulation learning-related model (Panadero, 2017)

Model	Publication	Total citations	Citations year*
Boekaerts	Boekaerts and Corno, 2005	1011	84.25
Efklides	Efklides, 2011	251	41.83
Hadwin et al.	Hadwin et al., 2011	196	32.67
Pintrich	Pintrich, 2000	3416	200.94
Winne and Hadwin	Winne and Hadwin, 1998	1037	54.58
Zimmerman	Zimmerman, 2000	4169	245.24

Boekaerts and Corno (2005) presented the adaptive model of self-regulation learning consisting of Intellectual structure and motivation. The intellectual structure consists of the formulation of intellectual strategies, Cognitive strategy control and motivation, it consists of defining and controlling motivation strategies and beliefs about metacognition as in the picture;

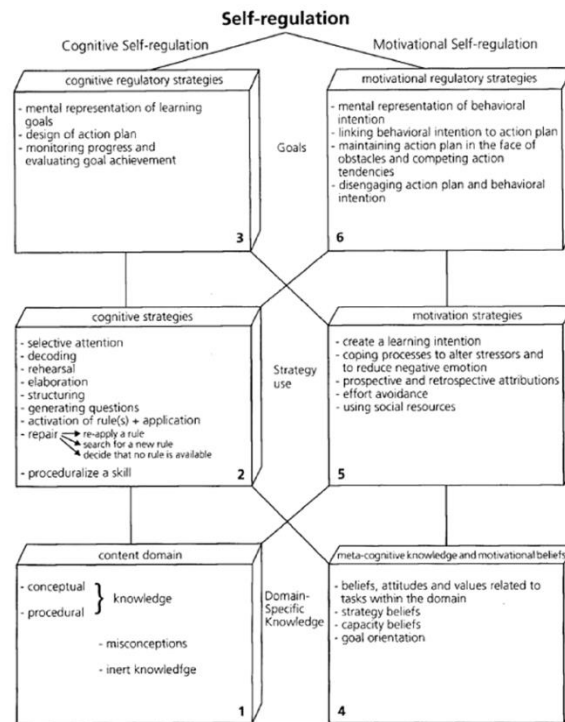


Figure 23 Model of Adaptable Learning Boekaerts and Corno (2005)

Pintrich (2004) introduced the scope of self-regulated learning, consisting of 4 phases: forethought, planning and activation, monitoring, control, and reaction and self-reflection. In this regard, the scope of self-regulation is divided into 4 areas, namely cognition, motivation, and behavior and different context as shown in the table;

Table 7 Phases and areas of self-regulated learning model Pintrich (2004)

Phases and relevant scales	Areas for regulation			
	Cognition	Motivation/Affect	Behavior	Context
<i>Phase 1</i> Forethought, planning, and activation	Target goal setting Prior content knowledge activation Metacognitive knowledge activation	Goal orientation adoption Efficacy judgments Perceptions of task difficulty Task value activation Interest activation	Time and effort planning Planning for self-observations of behavior	Perceptions of task Perceptions of context
<i>Phase 2</i> Monitoring	Metacognitive awareness and monitoring of cognition	Awareness and monitoring of motivation and affect	Awareness and monitoring of effort, time use, need for help Self-observation of behavior	Monitoring changing task and context conditions
<i>Phase 3</i> Control	Selection and adaptation of cognitive strategies for learning, thinking	Selection and adaptation of strategies for managing, motivation, and affect	Increase/decrease effort Persist, give up Help-seeking behavior	Change or renegotiate task Change or leave context
<i>Phase 4</i> Reaction and reflection	Cognitive judgments Attributions	Affective reactions Attributions	Choice behavior	Evaluation of task Evaluation of context
<i>Relevant MSLQ Scales</i>	Rehearsal Elaboration Organization Critical Thinking Metacognition	Intrinsic Goals Extrinsic Goals Task Value Control Beliefs Self-Efficacy Test Anxiety	Effort Regulation Help-Seeking Time/Study Environment	Peer Learning Time/Study Environment

Whereas Zimmerman (1989) proposed the cycle of regulation including person, behavior, and environment which affect each other, and later on Zimmerman (2002) specified the model of self-regulated learning consisting of 3 important phases which are

- 1) Forethought Phase
- 2) Performance Phase
- 3) Self-Reflection Phase

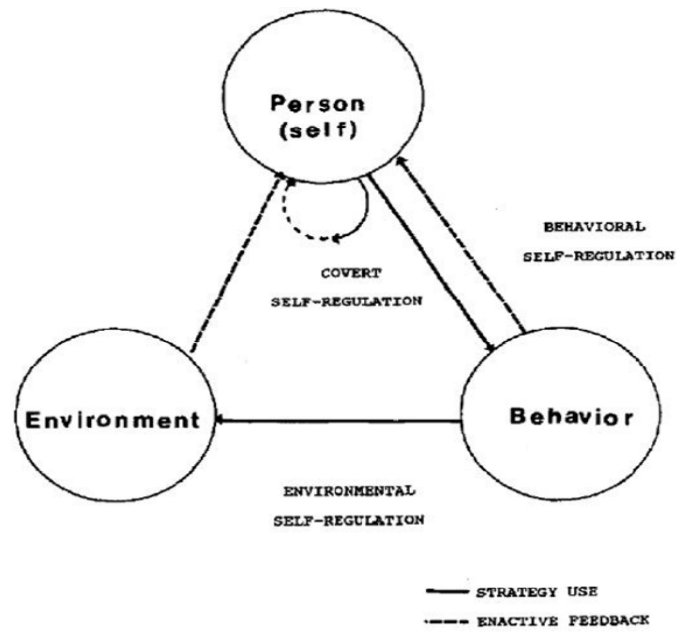


FIGURE 1 | Triadic model of SRL. Adapted from Zimmerman (1989).

Figure 24 The cycle of regulation from Zimmerman (1989)

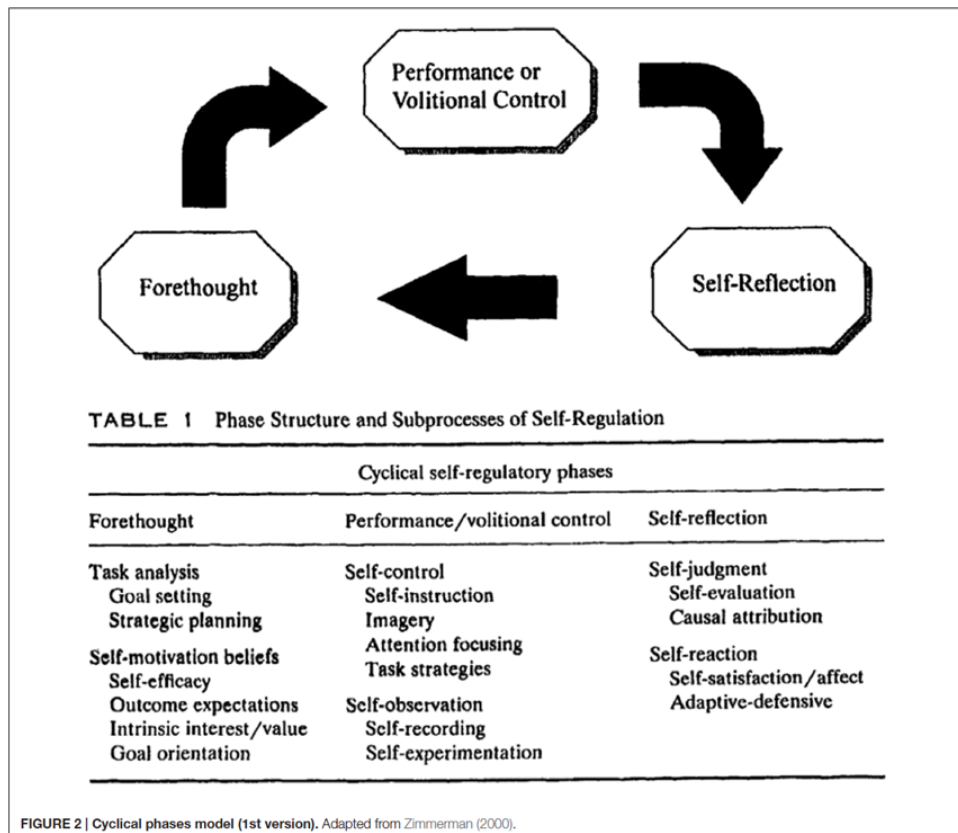


FIGURE 2 | Cyclical phases model (1st version). Adapted from Zimmerman (2000).

Figure 25 Zimmerman model of Self-Regulation

In conclusion Panadero (2017) has synthesized the concept behind self-directed learning in each phase from the following 7 important models;

Table 8 Phases of self-regulation learning

Model	Phases of SRL		
	Forethought Phase	Performance Phase	Self-Reflection Phase
Boekaerts	Main interpretation Targeting Performance goal	Performance	feedback
Efklides	Task representative	Metacognition, Doing task	
Hadwin et al., 2011	planning	Follow up and control	Self-regulated
Hadwin et al. (in press)	Negotiation and task awareness	Strategy and task participation	adjustment
Pintrich	Prepare, planning and utilize	Follow up and control	Reaction and self- reflection
Winne and Hadwin	Define, set goals, and planning	Utilizing strategies	Meta cognition uses of strategies
Zimmerman	Task analysis, motivation	Self-control Self-observation	Self-reflection, self- evaluation

Self-regulation in the online learning environment

Triquet, Peeters, and Lombaerts (2017) have identified online self-regulatory strategies including

Suggestion 1: Have students connect the theories learned online with job training by setting personal goals or personal goals of the course leading to better learning.

Suggestion 2: Help professional learners reflect knowledge gained from the course and may practice it before completing the course.

Suggestion 3: Support learners to continuously monitor their learning to create learning value.

Suggestion 4: Take advantage of inspiration by determining the expected learning outcomes.

Suggestion 5: Encourage students to discuss ideas with colleagues in external networks as well as other students in the course.

Suggestion 6: Utilize the knowledge and experience the learners have to connect to the learning context.

Barnard-Brak, Lan, and Paton (2010) have identified sub-elements of self-regulation in an online learning environment. Self-Regulated Learning in the Online Learning Environment consists of environment structure, goal setting, time management, help-seeking, strategy setting Task strategies, and self-evaluation.

4.3 Self-Regulation Measurement

This study conducted the synthesis of the self-directed learning test as follows;

Table 9 The synthesis of the self-directed learning

		Items	Scale items	Contexts
Self-Regulatory Learning Interview Schedule: SRLIS	Zimmerman and Martinez-Pons (1986)	12	7	-
Self-Regulation Learning Inventory: SRLI	Lindner et al. (1996)	71	5	Undergraduate students
Self-Regulated Learning Skill Inventory: SRLSI	Heo (1998)	29	-	Learning Environment
Self-Regulation Trait Questionnaire	Herl et al. (1999)	32	4	Problem solving
Self-Regulation Questionnaire *	(Brown, Miller, & Lawendowski, 1999)	63	7	Higher Education dimensions
Self-Regulatory inventory	(Hong & O'Neil Jr, 2001)	34	4	Korean undergraduates
Short version of self-regulation Questionnaire: SRRQ	(Carey, Neal, & Collins, 2004)	31	-	Alcohol drinker
Academic self-regulation scale	(Bembenutty, 2005)	24	8	Pre-service teacher
Teacher Self-Regulation Scale (TSRS)	(Capa-Aydin, Sungur, & Uzuntiryaki, 2009)	40	9	Pre-service teacher

4.4 Behavior Regulation

The concept of self-regulation is about how learner can regulate their cognitive strategies, metacognition, motivation, and environment. Teacher plays the crucial role to promote the self-regulatory process; teacher as learners, self-regulated teacher, and the promotion of students self-regulated learning. The teacher as learner is the way that teacher be able to learn and form practices by working and engaging in the social environments and dealing with distractions. Teacher need to be an effective learner first as they might benefit from self-regulation learning as well as the students. For self-regulated teachers which is described as the proactive agents to the educational beliefs and instructional practices. The self-regulated teacher is distinction between the self-regulation of teaching and the self-regulation of learning from teaching to understand the development of student learning strategies and to cope with the needs of students. Lastly, a self-regulated teacher will be able to promote the students self-regulated learning.

4.5 Cognitive Regulation

Modrek, Kuhn, Conway, and Arvidsson (2019) defined cognitive regulation differently from the behavior regulation. Since self-regulation is the fundamental of learning, research among regulation have go beyond to distinguish distinct components into cognitive regulation and behavior regulation. Cognitive Regulation is defined as one being inhibition or dismissing distracting and switching of attention form one task. Recent studies showed that cognitive regulation can be used as the indicator for overall regulation. Researchers used the Shape School Task (Espy, 1997) for the cognitive regulation assessment. The research findings revealed that cognitive regulation is more important contributor to effective learning than behavior regulation. Behavior regulation that seems to be important for teachers and parents has been regarded as essential to the academic achievement.

Cognitive regulation can be used to predict the learning skills rather than behavior regulation. Researchers stated that emphasizing on behavior regulation as a

key of effective learning might be misplaced. However, in my own opinion, I think that the links between two factors cannot be dissociate, we might focus on both kinds of regulation to make the successful learner. The further research should continue to study not only the deep learning but the individualized learning. The individualized tools for self-regulated learning should be developed. Sautelle (2015) states that cognitive ability or intelligence is a construct that uses to describe one's mental or brain. It is defined as a general mental capacity which includes different abilities; planning, problem solving, abstract thinking, quick learning, and learning from experiences. As the cognitive ability is consist of three cover areas; numerical ability, verbal ability, and spatial ability. White (2017) developed a framework provides the direction how to plan a self-regulatory competency lesson by integrating the levels of self-regulation learning and the cyclical phases using thinking aloud strategy which is used to achieve the goals in three aspects; a method of inquiry to understand cognitive processing, a method of instruction, and the aspect of social interaction.

For teacher development, Mattern and Bauer (2014) reported that teachers' cognitive self-regulation is related to the occupational well-being. The present study linked to the field trial for the OECD's program for international student assessment (PISA) in Germany. A number of 664 participant from 99 schools in four federal states of Germany is used for data collection. The confirmatory factor analysis approach and the structural equation modeling (SEM) is being used to assume the structure and specify the according models. The focus of this study factors the structure of teachers' cognitive self-regulation whether self-regulation fosters teachers' job satisfaction by reducing the emotional exhaustion and if it's related to the gender and the school track. Model of cognitive self-regulation which is the higher-order construct through several phases e.g. clusters if related strategies. To conceptualized the cognitive self-regulation as a competence because the individual behavioral disposition us manifested itself in the application of different SRL strategies that

support performance. (Khanzode & Sarode, 2016; Mori, Paternó, & Furci, 2014); van Leeuwen, Janssen, Erkens, and Brekelmans (2015) conducted the experimental study on the teacher regulation of cognitive abilities using learning analytics during student collaboration. Teacher always play the important role in monitoring and solving students' problems. The need of the supporting tools is to help teacher to perform better, especially using learning analytics tools. A total number of 40 participants were assigned to the experiment group (with LA tools) and control group (No LA tools). The results revealed that the teacher who had the access to the learning analytic tools has no significant different better at detecting students' problem with the control group. However, they showed the higher confidence to act and respond to the students' problems.

As a technological perspective, Computer-supported collaborative learning (CSCL) is one of the instructional strategies which with collaboration is supported by technology. Student s' learning activities are divided into the cognitive activities, social activities, and the regulative activities at both cognitive and social level. There are 2 tools used for supporting teachers. The Concept Trail (CT) displays a timeline of group discussion via chats in two ways; to check the on tasks cognitive activities and to find out the concept of overall discussion. Another tool is the Progress Statistic (PS) which helps teachers to check the progress of each groups using the number of written words in the text editor and chat tool.

4.6 Emotion Regulation

Heberle, Thomann, and Carter (2019) stated that emotion regulation is one key success for social and emotional learning. The term emotion can be used to refer to multiple levels of an organism's system, including:

- 1) the brain state associated with the presentation or withdrawal of an incentive
- 2) the subjective experience of a feeling state (e.g., butterflies in stomach)

3) the labels or meaning attributed to the feeling state (e.g., excited vs. anxious);

4) a behavioral manifestation such as an action or facial expression (e.g., muscle tension, eyes widening)

Yoo, Matsumoto, and LeRoux (2006) highlighted the influence of emotion recognition and emotion regulation on intercultural adjustment. The results revealed that recognition of anger and emotion regulation predicted positive adjustment. Researchers stated that international student may find difficulty coping with the unfamiliar culture eg. School system, language, communication and financial situation. Martin and Ochsner (2016) also shed the lights on implications of neuroscience of emotion regulation development in the education field. Researchers divided brain system into two types of study which are the Emotional Reactivity and the Cognitive Regulation. The emotional reactivity is used to responds to cues with positive or negative affective significance and reacts to the potential rewards. While the cognitive regulation supports the active self-regulation of emotion and involved in making judgment about the emotional states.




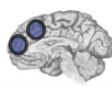
Type of Brain System				
Emotional Reactivity		Cognitive Regulation		
				
	amygdala & insula	ventral striatum	dlPFC & vlPFC	ACC & mPFC
General Function	<ul style="list-style-type: none"> Encodes salient stimuli 	<ul style="list-style-type: none"> Signals reward value 	<ul style="list-style-type: none"> Selective attention, working memory & response inhibition 	<ul style="list-style-type: none"> Monitors need for control; directs affective signals
Stimuli or Situations Where System Plays A Key Role	<ul style="list-style-type: none"> Responds to cues with negative or positive affective significance Tracks threat or exposure to stress and/or trauma 	<ul style="list-style-type: none"> Reacts to potential and/or actual rewards Responds to presence of peers particularly in adolescence 	<ul style="list-style-type: none"> Supports active self-regulation of emotion Supports attempts by caregiver to provide regulatory support 	<ul style="list-style-type: none"> Sensitive to conflict/ discrepancy between regulatory goals and current emotional state Involved in making judgments about emotional states

Figure 26 Type of brain system

Benfer, Bardeen, and Clauss (2018) stated the importance of regulate negative emotion in social cognitive theory of emotion recognition stated that the ways to regulate negative emotional experiences are

1) *believing that he or she is capable of changing his or her current emotional state (i.e., emotion regulation self-efficacy)*

2) *have established outcomes that he or she is trying to achieve (e.g., improved mood), and*

3) *have established strategies or behaviors to implement in order to achieve the desired goal*

Emotion Regulation has dynamics in Adolescence, Hollenstein and Lanteigne (2018) state that motion regulation is defined by researchers as a process that unfold at the real-time as a dynamic temporal process both in theoretically and empirically modeled. Researcher developed the emotion system framework and proposed the effectiveness of real-time emotion regulation. The real-time emotion regulation is examined through the patterns of responses across emotion with the arousal, cognitive appraisals, and behavioral expressions, the relative flexibility of emotions, and the relations across real-time and developmental-time dynamics among adolescence

4.7 Self-Regulation in Practice

There are many self-regulations in practice especially, in teacher education. As we expect our students to be successful self-regulated learners, they might assume the same way with their teachers, either teacher should learn the self-regulation as learners to learn in and form the regulated practice before teaching, or to be a self-regulated teacher (Peeters et al., 2014). Previous studies have reported that pre-service teacher's self-reported strategy scores predicted the performance of self-regulation learning (Buzza & Allinotte, 2013).

Peeters et al. (2014) draws attention of the self-regulatory concept into the implications for teachers. The results indicated that teachers' own self-regulatory competences a critical determinant of self-regulation learning in the primary school. The more teachers understanding of self-regulation learning processed, the more trends to be the effective self-regulation learning promotion in the classroom. Self-regulation is the critical factor for academic success. In Pre-service Teachers' Self-Regulated Learning (Buzza & Allinotte, 2013) examined the relationship between teachers' own SRL and their ability to develop self-regulation in students. The results indicated the influences on learning strategies scores that can predict the understanding of SRL concepts. According to enhance students, SRL, the first step of goals is to promote pre-service teachers' ability to develop SRL in their students by helping them understand and recognize the SRL in classroom. The second is to learn how to support students with the intrinsic motivation.

Previous research has shown the association between the self-regulated learning and the academic achievement. This research presented the examination on how self-regulation learning and the motivational; and affective factors are related to the regulation strategies of behavior and context, and learning strategies. It has been found that the sub-processes of SRL which are the motivational, affective components, regulation strategies and learning strategies are related with each other. The intrinsic motivation is the predictor of regulated, context, and the learning strategies (Virtanen, Nevgi, & Niemi, 2013)

It is also possible to put the self-regulatory components into the training to enhance the self-regulatory competence and problem-solving behavior. The implication could be utilized in the short training course which combined the mathematic problem-solving contents and the self-regulatory together to increase the self-regulated and motivated learning together with the mathematic problem-solving skill. Perels, Gürtler, and Schmitz (2005) stated that Mathematic problem-solving is has the association on the self-regulatory.

5. Socially-Shared Regulation

5.1 Self-, Co-, and Socially-Shared Regulation

De Backer et al. (2018) has expanded concept of self-, Co- and Shared Regulation is introduced in this research. The view of assessing not only the individual regulation at self-level, but also the levels of regulating collaborative are discussed with 3 research questions. First, researchers aimed to develop the reliability to measure co-regulation competencies and its sub-facets using self-report questionnaire. Secondly, the study of the relationship between co-regulation competencies and the learning performance in a collaborative learning task has been explored. Finally, the validation of the qualitative measures of learning process is revealed. The number of participants were 212 to answer research question 1-2 and 34 participants participated in collaborative group setting to answer the third research question. The results also indicated the group scaffolding process through application, which will be help with the regulation processes and in-depth assessment both individual and social level.

Individuals may engage in collaborative learning as a high-level of cognitive processes. So that regulation research trends to shift from the self-regulated learning to more emphasize on social modes of regulation. Jarvela and her colleagues suggested 3 theoretical model at three social levels as proposed in this study are as follow;

Self-Regulation defines as individual members regulate their own learning.

Co-Regulation defines as individual learner regulate one or more partners' learning.

Shared-Regulation defines as the whole group regulate their learning.

This can draw attentions to theorize the social forms of regulation and the way to assess its. The results suggest that groups react differently to the regulation problem, students' trend to regulate their own learning more when it comes to the serious circumstance like the exam preparation. The conclusion regarding the role of socially shared regulation on the collaborative learners' outcome should be further investigate. Vanslambrouck et al. (2019) also state the areas of study fell into the regulation of cognition, the regulation of behavior, the regulation of context, and the regulation of motivation. The regulation of learning behavior is the ability to observe, monitor, control and regulate their behavior. The regulation of the context is very important for blended learning environment which is related to the autonomy and flexibility of students' learning processes. In blended learning, prompts can be integrated into the online environment to trigger students use of SRL strategies. This study also found the need of interactions between students themselves and students and teachers Finally, the involved in role model may help to facilitate help-seeking processes.

Social interaction is one of the key factors for the successful online learning. So that the idea of computer-supported collaborative learning environment has been adopted both the individual level and the coordination of the group (e.g. Planning and organizing activities). Teachers play the role to encourage students to be more active and engage in collaborative learning. The interaction between teachers and students is highly essential to maintain the degree of social presence which participants feel affectively connected to one another. In this study several of social-web based tools were used including blog, social network, file storage and sharing tool, forum, communication system, and wiki.

Greisel et al. (2018) described university students prefer to study in group, especially in the exam period. So that the focus has been shifted to the personal priorities, working styles, and communication which the achievement goals within groups in regulation process could be used. For student teacher, Saariaho et al.

(2018) considered self- and co-regulated learning as the effective tools in student-teacher learning. In co-regulated learning, peers and teachers work closely in the regulation process. Saariaho et al. (2019) investigated the co-regulated learning in student teacher – pupil interaction in the authentic classroom situation during teaching practicums. The results showed the embed of co-regulated learning behavior into the critical incidents in classroom interaction which teachers play a key role when pupil learn to regulate their own learning processes.

6. 70-20-10 Learning and Development Model

70-20-10 learning and Development Model is grounded from (Lombardo & Eichinger, 1996) which the proportion of learning is about 70% from on-the-job experiences and working on tasks and problems, 20% from feedback or working around good and bad examples of the need, and 10% from courses and reading. Lombardo has provide the significance of 70-20-10 learning model which will help to learn better and make the development plan more effective.

There are the following example of learning in 70-20-10 learning and development model: Learning to Learn Better

1. Form a learning network with others working on the same problem
2. Examine why you judge people the way you do
3. Form an advisory group to help you

Learning from experience, feedback and other people

4. Being a student of others
5. Learning from bosses
6. Learning from interviewing others
7. Learning from observing others

8. Learning from limited staff

Learning from courses

9. Supervisory Courses

10. Sending Others to Courses

This rule suggests that successful leaders learn within three clusters of experience: challenging assignments (70%), developmental relationships (20%), and coursework and training (10%) both in classroom events and eLearning setting (Rabin, 2013).

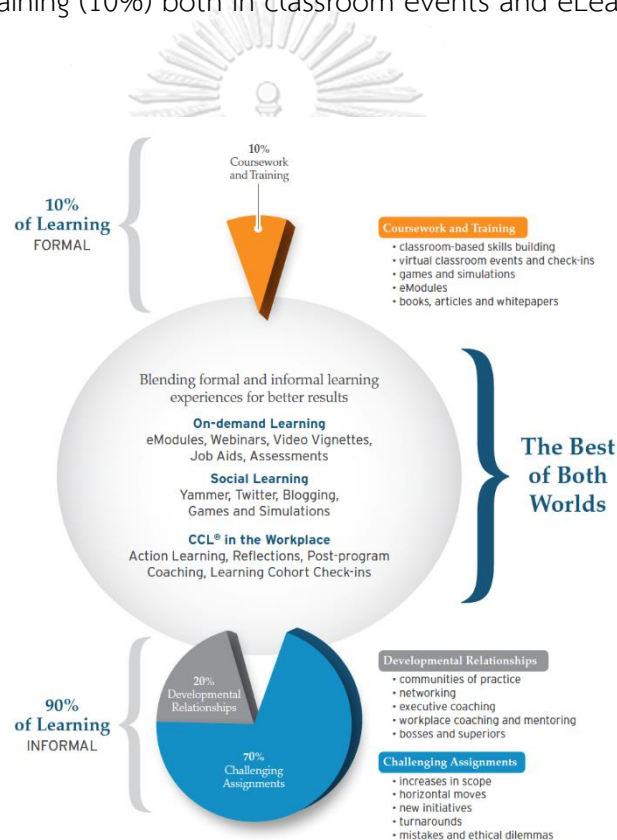


Figure 27 The 70-20-10 Learning and development model (Rabin, 2013)

Scott and Ferguson (2014) state the 3 Stages of development following:

Stage 1 individual development plan

- identify career goals
- Assessing the skills and competencies

- Planning the individual development plan
- Implementing the plan
- Evaluating the problem

Stage 2 Social and team learning

- Group learning
- Retrospective learning

Stage 3 Developing plans

- Analysis of performance needs
- Becoming consultants

The interpretation the terms of 70-10-10 learning and development model that the formal learning is realized value as low and separate from work, while social learning and experiential learning is increasing values and integrated with works (Scott & Ferguson, 2014).

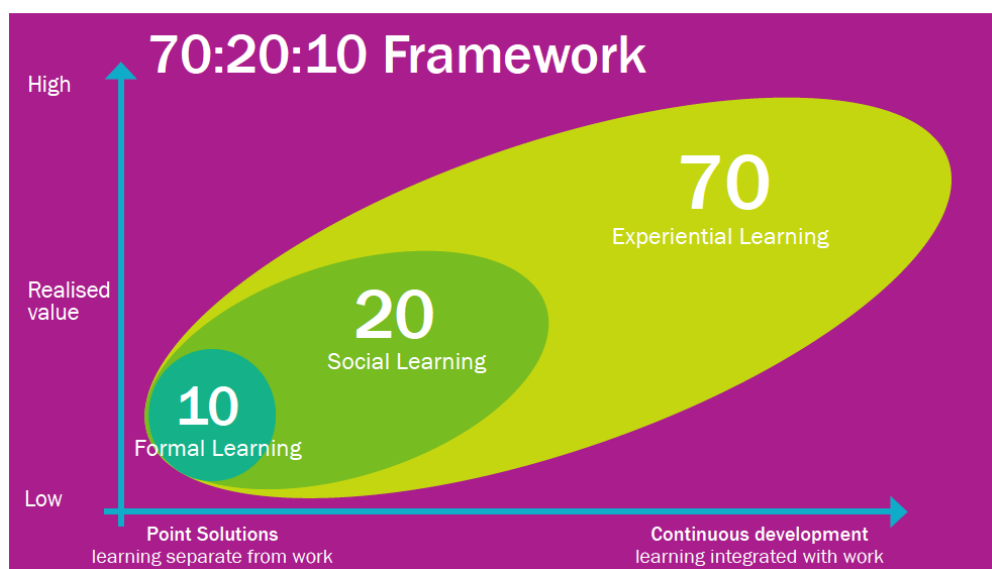


Figure 28 70-10-10 learning and development model (Scott & Ferguson, 2014)

The context of studying the 70-20-10 learning and development model has divided into 2 groups which are the development of skills and to form up the

learning ecosystem. Revilla Muñoz, Alpiste Penalba, Fernández Sánchez, and Santos (2017) deployed an online course about ICT problem-solving skills based on the 70/20/10 model for learning and development which the results show the success of the course when it comes to increasing the ICT problem-solving skills and to reducing techno-anxiety. While Moonlenburgh (2018) Considered the implications of neuroscience to gain attention and engagements among learner with the following issues:

- “• *Learning needs to generate mental links to existing knowledge.*
- *The stronger we feel emotions during the learning, the more we learn.*
- *Learning experiences need to be spaced. Learning consistently over time can layer emotions, experiences and knowledge, amplifying the impacting the behaviour change or skills development.”*

For learning ecosystems, 70:20:10 learning models have a dual role: providing feedback to their team member about their performance, and leading conversations that encourage reflective thinking and continuous learning (Petterd, 2016). Johnson et al. (2018) suggest future research seeks to explicate the role of social learning in supporting the efficacy of both formal and experiential learning. Here is the synthesizing of learning activity and tools used in 70-20-10 learning context.

Table 10 The synthesise of learning activity and tools used in 70-20-10 learning

Activity	(Joshi, 2018)	(Petterd, 2016)	Tools	(Rabin, 2013)	(Scott & Ferguson, 2014)
70% on-the-job experiences					
Practicing Skills	√		eModules, Webinars, Video Vignettes,	√	√
Stretch assignments	√	√	Job Aids, Assessments Social Learning	√	
			Yammer, Twitter, Blogging,	√	
Challenges at work.	√		Games and Simulations	√	
			CCL® in the Workplace	√	
Assignments offering new experiences	√	√	Action Learning, Reflections, Post- program	√	
Coaching, Learning Cohort Check-ins	√		Coaching, Learning Cohort Check-ins	√	√
			Role shadowing		√
			Case Study		√
20% relationships with others					
Collaborative learning	√		• communities of practice	√	√

Activity	(Joshi, 2018)	(Petterd, 2016)	Tools	(Rabin, 2013)	(Scott & Ferguson, 2014)
Social Learning	√	√	• Social networking	√	√
Coaching and mentoring	√	√	• executive coaching	√	
Access to experts	√	√	• workplace coaching and mentoring	√	
Debriefs and assessment	√	√	• Discussion/ blog		√
			• Instant messaging tools		√
10% formal training					
Formal traditional courses		√	• classroom-based skills building	√	√
Structured courses					
Online courses	√		• virtual classroom events and check-ins eModules/ elearning	√	√
Training programmes	√		• Workshops/ Conference		√
			• games and simulations	√	
			• books, articles and whitepapers	√	√

Karoudis and Magoulas (2016) proposed the xAPI affordances described above are mapped to Digital Learning Ecosystems (DLE) to classify the three generations of Technology-Enhanced Learning (TEL) systems.

Table 11 The xAPI affordances from Karoudis and Magoulas (2016)

Dimensions	Digital Learning Environment	Tin Can API Experience API (xAPI) Affordances
Software architecture	Cloud architecture, mobile clients	Tin Can API Experience API (xAPI) Affordances Software architecture Cloud architecture, mobile clients RESTful web services (carry JSON payload) that allow activity providers store learning experiences in Learning Record Stores (LRSs), Tappestry mobile application
Pedagogical foundation	Social constructivism, connectivism	Supports recording and tracking of online and offline learning (formal, informal or operational) experiences, and therefore all types of pedagogies
Content management	Open, web-based, embeddable, placed outside, rich metadata	Allows for system-to-system communication, stand-alone system or embedded to an LMS, content can be linked to on the cloud, allows reporting and content analytics tools to extract data from any LRS
Dominant affordance	Reflection, sharing, remixing, tagging, mashups, recommenders	Capture of (big) data on performance, instructional content and performance context information (sub-APIs), sharing statements, aggregation of activity streams enables identification of learning paths that lead to successful learning outcomes

7. Social Tie-Strength

Tie-strength is considered as one of the factors in professional learning and it is defined as a relationship to others in social and emotional learning. The most common tactic used to measure tie strength has been to use indications of the "closeness" of a relationship; which indicated strong ties and weak ties. Marsden and Campbell (1984) has concluded that:

1) there be two distinct aspects of tie strength, having to do with the time spent in relationship and the depth of the relationship;

2) a measure of "closeness" or intensity is the best indicator of strength

To reveal the social tie-strength, the patterns in personal networks is discovered by many researchers. First, Feld (1981) determined whether foci can account for the patterns. From the of relevant patterns, there are four possible patterns of interrelations as shown in [Fig 29].

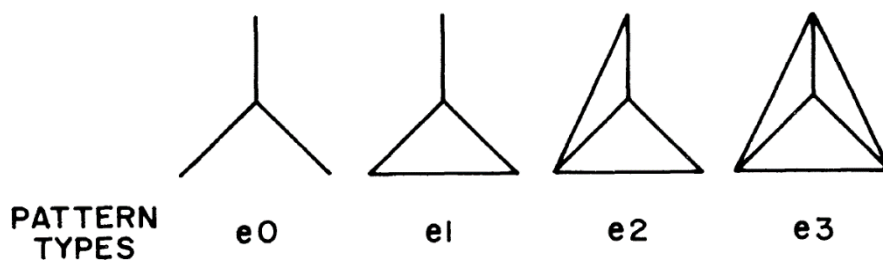
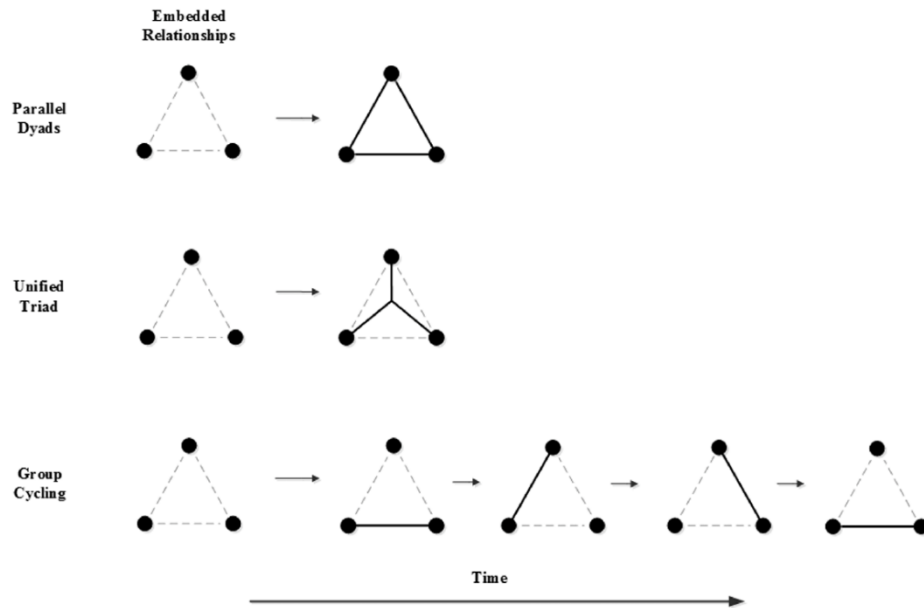


Figure 29 Pattern of interrelations

In the form of collaborative in organizational groups, J. P. Davis (2016) revealed the “group cycling” in a small group, decomposed innovative activities which interlinked between different pairs of partners, and managed third-party interests across time.



* Dashed lines represent strong-tie embedded relationships; solid lines represent collaborative forms in current alliances.

Figure 30 Group cycling

Zuo, Blackburn, Kourtellis, Skvoretz, and Iamnitchi (2016) considered social strength considers both edge weights and shared paths for quantifying users' social closeness containing the original graph, remaining graph after removing edge AB, graph without 2-hop length paths, and graph with only one shared edge between A and B.

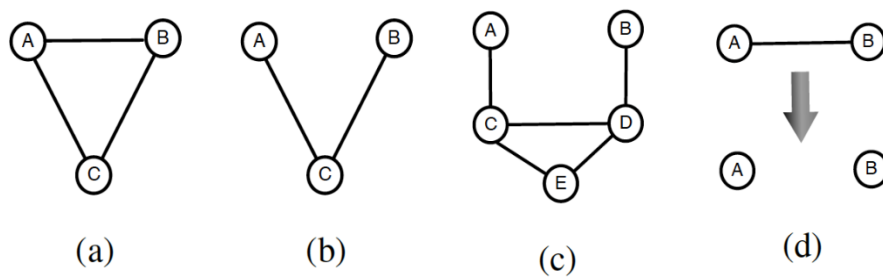


Figure 31 Edge weights and shared paths of social strength

Law, Wong, and Lau (2005) suggest four types of relationship ties illustrate two major aspects; emotional and structural bonding. The four types of relationship

ties are back-up tie, transference, contact tie, and information tie. The names of the four ties are given in accordance with their meanings.

<i>Structural Bonding</i>	Direct	<p>Information Tie e.g. distant relatives and general friends</p> <p>Provide wider scope of information</p>	<p>Back-up Tie e.g. kin and close friends</p> <p>Provide full support</p>
	Indirect	<p>Contact Tie e.g. the friends of acquaintances</p> <p>Provide long list of contact points</p>	<p>Transference Tie e.g. the friends of kin and close friends</p> <p>Provide bridging impact</p>
		Weak	Strong
<i>Emotional Bonding</i>			

Figure 32 Four types of relationship ties Law et al. (2005)

Because of the fast expansion of internet use and the constant growth of on-line, Petróczi et al. (2007) have developed the notion of tie-strength concept in social network analysis. Strength of a tie is a quantifiable property that characterizes the link between two nodes acquaintances and friendship.

To describe the social sphere between strong and weak ties, Huszti, Dávid, and Vajda (2013) proposed the dimension in tie-strength as follows;

Table 12 Social sphere between strong and weak ties

Dimensions	Strong ties	Weak ties
Quantity Density	Below 10	many

Multiplexity	large	small
Bridge role	Little probability	High probability
Integration	Level of micro-society	Level of macro-society
Language code	Limited/ restricted	Detailed/ worked out
Activity	Expressive (want to save)	Instrumental (want to catch)
Social visibility	close	Open to the world
Social status	low	high

Goldenberg and Gross (2020) considered that people spend considerable time on digital media, and are thus often exposed to expressions of emotion by other people, researcher so on proposed the digital emotion contagion model [Fig33]

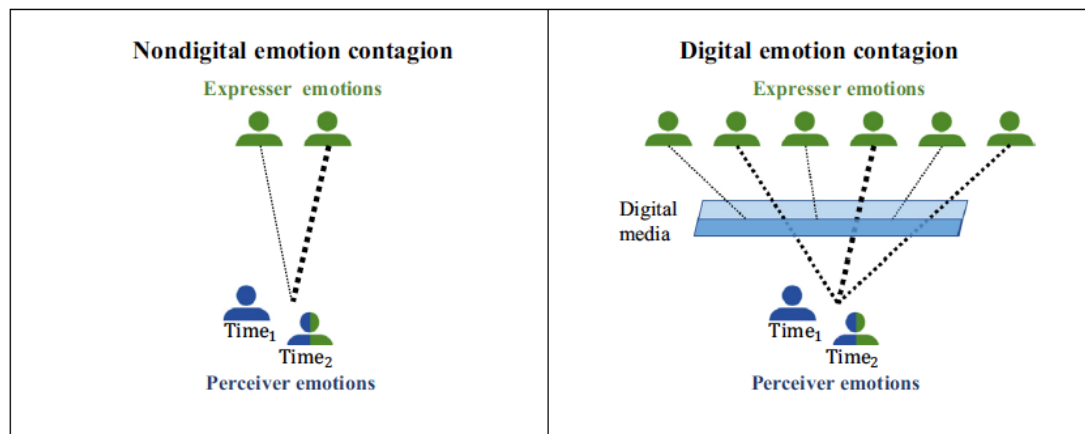


Figure 33 Digital emotion contagion model

8. Web of Emotions

8.1 Emotion Recognition

To develop the emotion regulation, many of researches have thrown up the ideas in emotion recognition using physiological signals. The comprehensive review focused on the emotion models through the framework for emotion recognition based on the physiological signals. The factors to consider when researcher want to evaluate the emotions are stimulus (e.g. Music, video, film), subject dependency, signals used and which emotions to be evaluated. Further research needs to be done to identify the learning a person's emotion changing process and it can be used as a critical to improve people's life quality.

Shu et al. (2018) used the literature review approach to reveal the emotion recognition using physiological signals in the related topics including emotion models. In general, the emotion recognition is categorized into two categories which are the physical signals for example facial expression, speech, gesture posture which can't be guaranteed the reliability and another one is the internal signals such as electroencephalogram (EEG), temperature (T), electrocardiogram (ECG), electromyogram (EMG), galvanic skin response (GSR), and respiration (RSP) which changed in the certain way when people face specific situations. Researchers mentioned the traditional machine learning which is the model specific methods and require hand-crafted features and the deep learning methods which can learn the exact features automatically. This research also mentioned the deep learning methods such as convolutional neural networks (CNNs) and also DBN, PNN, and LSTM together with the database provided for human emotion analysis. In the line with Egger et al. (2019), he states more signals such as the Facial Recognition (FR), Speech Recognition (SR) and Voice Recognition (VR), Heart Rate Variability (HRV), Electrodermal Activity (EDA), Skin Temperature (SKT). The Self Assessment Manikin (SAM) developed by Bradley and P. Lang which is widely used to extract emotions. As emotions play a crucial role in learning which is influenced on the human brain

processing such as learning memory, perception and problem solving, this article presented the key aspect of the various physiological signal analysis.

8.2 Collaborative Note-taking

Collaborative note-taking is one of the cognitive tools that people can use to become more critical throughout the reflective cycle. However, this study put forth a paradigm for an online collaborative note-taking technique that generates advantages from reflection in both collaborative learning and learning contexts. Collaborative note-taking is a responsibility in sharing note via different platform. During class meetings, students alternate taking notes in a shared way (e.g. Google document). Designates students to take notes for the day during each class meeting. When taking notes, students have the option of writing them down by hand or using a laptop (Harbin, 2020). He proposed the issues to consider of adopting collaborative note-taking in four aspects:

- 1) Different levels of preparation affect the effectiveness of taking notes.
- 2) Explicit expectations and norms for group note-taking assist the students.
- 3) The role of collaborative note-taking should be clearly defined by the instructors and communicated to all students.
- 4) Teachers should carefully group notetakers using results from a pre-class survey.

Previous researches have shown different methods for note-taking. E.g. The Learning Strategies Center (2001) Cornell University has set the process of taking notes, including recording during lectures, using notes columns.

Via the use of questions to reflect on the content by asking questions to yourself. For example, what is the importance of facts? What are the principles? and a review that takes at least ten minutes every week to check the record. This process can be applied to the design of teaching and learning of students in the teaching profession.

However, from the social perspective, Seel, Lehmann, Blumschein, and Podolskiy (2017) have revealed the three presences (Social, Cognitive, Teaching) and its related to instructional activities. This concept is in the line with social cognitive theory is originated by Bandura (1976), has described the social learning theory as a learning process that can occur from other people. Through observation or modeling from the experiences of others without the need to try trial and error by yourself. The learning process occurs from the interaction with the environment in society by the process of observing or imitating.

We bring the both concepts to integrate with the emerging technology which has resulted more notes being made online. Y.-F. Yang and Lin (2015) proposed the online collaborative note-taking strategies that allow other people to use online memo boards and can be work together on the same sheet for the same period. Glasswell and Ryan (2017) defined reflection as a collaborative process engaging with others to enable them to think differently. This process can be applied to teaching design in both learning planning and controlling of efficiency in learning design. Pre-service teacher might reflect to improve efficiency and promoting the stakeholders to participate, expand ideas, and provide necessary support and feedback. In this study we synthesis the tools and platforms that can enabling pre-service teacher to use for collaborative note-taking.

Although taking notes is typically thought of as a solo activity, the findings of this study indicate that students may benefit from more collaborative note-taking. Students' perceptions of the value of note sharing were typically favorable. especially note-sharing after lectures (Crawford, 2020).

Collaborative note-taking allow students the opportunity to discuss with their peers and to express their own perspectives (Lynch, 2009).

Table 13 Synthesis of the collaborative note-taking tools

Tools	Goodnote	Noteability	Evernote	Word Document Onedrive	Onenote	Google Sheet	Sketchboard	Microsoft Whiteboard
Web Application	✗	✗	✗	✓	✓	✓	✓	✓
Mobile Application	✓	✓	✓	✓	✓	✓	✗	✓
Import files	✓	✓	✓	✓	✓	✓	✗	✗
Typing	✓	✓	✓	✓	✓	✓	✗	✗
Collaborative -typing	✗	✗	✓	✗	✓	✓	✗	✗
Free Handwritten	✓	✓	✓	✓	✗	✗	✓	✓
Drawing Pen	✗	✗	✓	✗	✗	✗	✓	✓
Sharing to others	✓	✓	✓	✓	✓	✓	✓	✓
Free	✗	✗	✓	✓	✓	✓	✓	✓
In App- purchases	✓	✓	✓	✓	✗	✗	✓	✓

8.3 Web 5 Technology

Khanzode and Sarode (2016) have studied the evolution of world wide web phenomenon from the beginning of web 1.0 to web 6.0. The moving from informative web to the using of artificial intelligent and intelligent interaction between human and computer is clearly stated within the timeline. It is also shaping the future trends if using web technology which can be adapted in the various areas.

Beginning with **Web 1.0**, when world wide web is introduced as a web of information by Tim Burners-Lee in 1989. The interlinked hypertext document displayed on web via the internet connection. Web 1.0 is considered as a read-only web, making the information visible to anyone at any time, but yet still little interactions.

Later **Web 2.0** aimed at the development of social interactions. The people-centric web and participative web is a social digital technology which brings global crowds with common interests together. The community is generated in the social network which people began to exchange information. In the Web 2.0, the information sharing across platforms are still limited.

Web 3.0 is known as a semantic web with the concept of data management and data sharing. The web of data envisions integrated in the world-wide database which focusing on making data openly accessible with the open source software platform, distributed database, and web personalization.

Web 4.0 brought the concept of ultra-intelligent electronic agent, symbiotic web and ubiquitous web which machine would be clever and powerful as human brain. The Web 4.0 has accuracy on reading and writing content if the webs.

The concept of **Web 5.0** is still debatable and there is no exact definition. The possible ideas for web 5.0 can be described as a symbolic web in 3D virtual world and its artificial intelligence. It is also considered as the emotionally neutral which allow users to interact with content. E.g. The real time changing facial expression on avatar.

Researchers continue to bring the concept of Web 6.0 which deliver web hosting services. The architecture within Web 6.0 is adjustable, and users can manage sever resources efficiently.

While emotions play the important role in Human and Computer Interaction, however a few numbers of research have been conducted to indicate the utilization of emotions in Web applications. In this research, researchers draw attention to create the design criteria uses for the web applications which adapted to different emotions. Researcher aimed at investigating the impact of web design criteria to create the particular emotions. 50 participants (age 26-59) were asked to complete the questionnaire in three parts including; personal information, classification of emotions which they had to test six web interfaces then they have to relate them with the specific emotion according to six emotions-based, and the emotion-based web design opinion which user had to give opinions associating each emotion with the various web interfaces. For the classification of emotions in web interaction, researcher conducted with 6 clearly distinguishable design characteristics which are 1) hate and love; 2) anxiety and serenity; 3) boredom and fun which indicated by users. The domain attributes were user activities, colors, web page & content structure, multimedia elements, navigation elements, and interactive elements. Apart from the classification, users also suggest to adapt the positive web design extending to the educational environment (Mori et al., 2014).

The possible implication for the web 5.0 which indicated the sensory and emotional knowledge together causes teachers in higher education to develop the emotional competences to transfer these knowledges to their students. Researcher developed 3 types of web 5.0 activities which are; pre-created Web 5.0, student task-based Web 5.0, and teacher-based Web 5.0 activities. The study from 120 strategic management students who took the self-report questionnaire revealed that students

have a positive attitude to use Web5.0 and enjoyed doing activities. Emotional Competences get involve in the field of educational research as known of the set of knowledge, abilities, skills and attitudes required to understand, express and appropriately regulate emotional phenomena. Emotional Competences consist of emotional awareness, emotional regulation, emotional autonomy (self-management), social competence, life skills and well-being. The evolution of world wide web was increasing over time. Web 1.0 is the basic web providing information, Web 2.0 developed over time for social web which focusing on sharing information and collaborating with others, Web 3.0 combined the web into database and used artificial intelligence, later Web 4.0 is based on the wireless communications. The emotive web is designed for personalize interactions between computer and human which Web 5.0 can be used as a tool for communications, providing information, and doing problem-solving tasks. Researchers concluded that teachers need to be active and being a critical Web 5.0 user is very crucial for developing the high-quality Web 5.0 resources. More research is needed to better understand the emotion exchange process via web 5.0 as well as the study about the importance of emotional communication for human's well-being. The benefit of this research showed that at the present time, a few research were conducted with the theme of emotional web, while developer still focus on Web 3.0,4.0 (artificial intelligence and IOT), a further develop on emotive web is one of the interesting topic, both in personalized-learning and social context (Benito-Osorio et al., 2013).

For example of previous studies, Giani, Brascio, Bruzzese, Garzillo, and Vigilante (2007) developed the algorithm of emotions and cognitions for illness narrative topic in the e-learning setting, In the field of medical education. Researcher stated that In fact, both emotional and cognitive systems are interdependent. The interconnections between both factors drive on the active adaptation to the environment as emotions give a sense of judgement processes and convey intrinsic cognitive value. Illness narrative in the narrative role-play approach in the situated

learning thus involving the same time in both emotional states and cognitive issues. And we cannot refuse that emotions are not only the psychological factors but it can't be separated from the decision-making process.

Researcher believed that the human-computer interaction is traditional usability approaches and limited which these could be extended to the enjoyment. The enjoyment which is the hedonistic emotions that ranges from cognitive to the physical and arising from a well-designed. The focuses from the 3 factors are as follow;

Engagement focuses on the high level of attention.

A positive affect focuses on the feeling of pleasure.

The fulfillment focuses on some need or desire.

Lin, Gregor, and Ewing (2008) investigated the measurement scale on the enjoyment of web experience. This research aimed to develop the reliability and validity of the instrument to assess the enjoyment of web experience. The exploratory factor analysis and the confirmatory factor analysis are used for scale development validation. The scale consists of 14 items with 3 dimensions of enjoyment which are 1) Engagement (Focused Attention), 2) Positive Affect, and 3) Fulfillment (Need or Desire). The 9-point likert scale were carried out with a total of 85 people for EFA process and 111 people for CFA process. The structural equation modeling (SEM) indicated that the model reasonably good fits to the observed data. Hartanto et al. (2020) revealed the approximately 9 years longitudinally which using a greater computer use overtime predicted positive changes in cognitive and socioemotional benefits such as executive functioning, sense of control, optimism, self-esteem, and social relationship.

9. Review of Prototypes

9.1 Prototype on emotion-recognition

A positive reaction and appealing are revealed by the users. It can be used as a tool to collect the emotion data, processing the improvement in healthcare and promoting the positive psychology helping people to be reflective on their life. However it has low validity because the research is in the first stage developing prototype. Further investigation, research need to develop the wearable device and its application in further. The study had a few participants with the various ages, further exploration needs more participants and long duration to gain more insights.

Several researchers developed the prototype on the emotion detection, Löw et al. (2015) developed the ZENse prototype with the small explorative study. There were 5 participants with the age of 17-59 years experienced the prototype testing. They began pressing blue (representing positive emotion) and red (representing negative) button on the wearable wristband prototype in the morning. The Bluetooth signal is used to send data to the smartphone, after that participants can reflect themselves associating with their experiences. Positive psychology to develop and nature resilience, identity and optimism along with the personal monitoring and feedback systems are used to create the prototype in this pilot study. The reflection approach is used to reflect on emotions. Researchers adopted the idea of gamification and utilized the user-oriented design in the development process. Researchers used smartphone application as an emotion tracker and prompting the user with regular surveys throughout the day.

Liu et al. (2018) presented the wearable system using multi sensors to acquire the physiological signals including; a single channel Electroencephalogram Signal, Respiration, Electrocardiogram (ECG), and Body Posture. A Developmental research revealed the system design and development process to reduce the complexity of the algorithm and equipment costs on wearable device. The multiple wearable sensors were included to acquire the physiological signals and uploaded data via

WiFi under the control of main node. A number of 36 different experiments were taken including 12 positive samples, 12 negative samples and 12 neutral samples. The results showed that the proposed design can be used as an embedded online analysis to enhance the usability of emotion classification. The validity and the usability were used to evaluate the design and development process which all results showed a significant improvement of the classification accuracy. However, a lot of work should be done in order to develop less subject-dependent and embed the small database for better robustness.

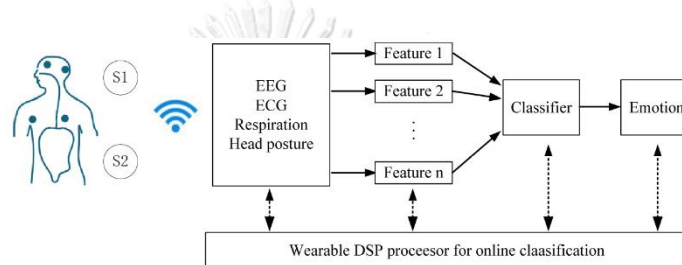


Fig. 1. System diagram.

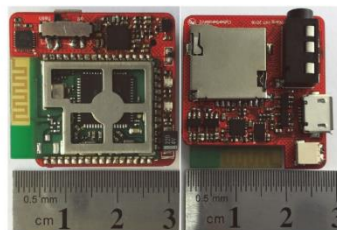


Figure 34 Wearable system using multi sensors prototype

Afroz, Shimanto, Jahan, and Parvez (2019) states that cognitive load and emotional states may impact the cognitive learning process especially in visually impaired peoples (VIPs). The experiment through the Electroencephalography (EEG) was conducted 9 healthy visually impaired adults (6 female and 3 male) with the challenges of the different indoor environments. The research results suggest that both one's emotional state and cognitive load can have noticeable effects as cognition such as understanding knowledge through our thoughts, experiences, and senses.

9.2 Web 5.0 Framework & Prototype

Human-computer interaction which is related to the emotions, cognition and product design. Although emotions have less understood by researchers than cognition, but both emotions and cognition can be regarded as information processing system. Cognition helps people to interpret whereas emotions help people judge and assign positive or negative to the environments. For the product design prospective, designer should consider the visceral design (the impact due to appearance), behavior design (experience look and feel), and the reflective design (users' opinions)

Bonnardel, Piolat, and Le Bigot (2011) studied the impact of colour on Website appeal and users' cognitive processes. The participants consist of 50 website users and 30 website designers. They were asked to indicate how much they like about the 23 different homepages (7-point Likert scale from "not at all" to "a lot"). The examples of website pages presented with 3 different aspects; blue, orange, and grey color; with main menu and submenu; linear and nonlinear page. The research findings showed that blue and orange are the most appealing color. Blue still be the popular color at all ages which consisted with the previous research. The finding for orange color is quite contrast with the previous research that hotter color showed less favorably than cooler color. While grey plays less appealing than other two colors. Finally, together "orange" color and "nonlinear" layout performed better to increase memorization.

Web application for data collection. The research project called LETS GO which stands for Learning Ecology with Technologies from Science for Global Outcomes. The project provided the scenario that end-users themselves can create their own mobile application.

The framework proposed in this study consisted of 4 aspects which are; End-user programming, Mobile Mashup Application, Visualization, and Cross platform development.

- Ended-user programming is a tool for designing one own mobile application.
- Mobile mashup application is a tool to combine different services or APIs.
- Visualization is a tool to provide the data visualization generated by mobile application.
- Cross platform development is a framework for platform independent.

Bower and Carroll (2017) conducted the pilot study on development of real-time emotional state and triggers web applications to promote teacher wellbeing. The research consists of two phases which are; the development of web-based application and the pilot test with school teachers. The web-based application prototype is developed to answer the common emotional states that affect teacher performance and the possible triggers to these emotional states. To test with pilot study, a total number of 11 Australian teachers who teaching students from 12-15 years were participated. The panel random-effect regression was tested to in a multivariate environment. Self-determination theory points out the human need of autonomy, belonging and competence to live well. Emotions play the important role to create dynamic feedbacks between brain, body, and mind. The teacher emotional experiences run on; unsafe-safe, flustered-calm, angry-content, upset-angry, bored-engaged, nervous-confident, worried-relaxed, frustrated-satisfied, unconnected-connected, disorganized-organized, overwhelmed-in control.

Martín de Diego et al. (2018) developed the visual framework for dynamic emotional web analysis. This framework highlighted on the process of processing data from the database and model of extracting data to visualize on the display. The uses of word cloud is adopted to visualize the visual information which is strongly represented the brand image and its overview of situations in facing sources of information. The model is useful as a high validity and reliability, once there were several tests have been developed. Further research needs to be developed more functions including in the framework, and could be extend to the semantic level.

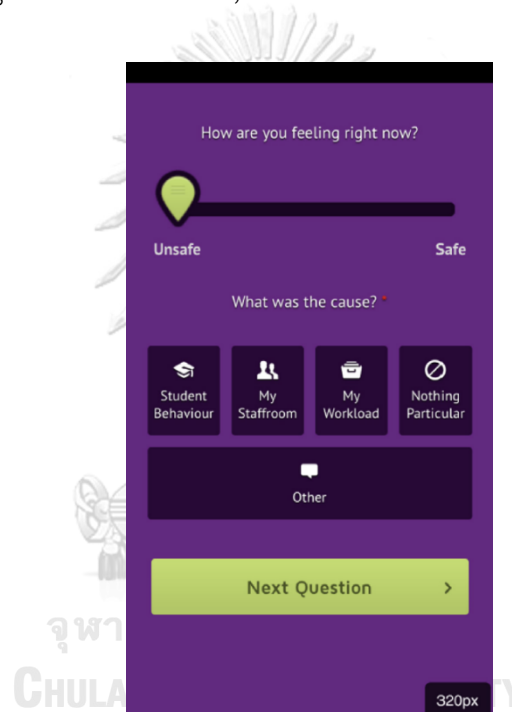


Figure 35 Dynamic emotional web analysis

10. The theoretical model framework

To form the model based on the theoretical perspective, we have divided the research model into 5 parts. The review of related research has showed the possibility of the big research

First of all, at individual-level Self behavior emotion cognitive self-awareness, self-management Self-Regulation were developed. Zimmerman (1989)'s Triadic model of self-regulation learning follows the social cognitive theory, self-regulation is the distinctive of the interaction of personal, behavioral, and environment triadic processes. While regulation of one's self may contain 3 factors which are Behavior Regulation, Cognitive Regulation, and Emotion Regulation (Buzza & Allinotte, 2013; Ifenthaler, 2012; Peeters et al., 2014). The findings from relevant literature lead to the determination of self-regulation model [Figure 36].

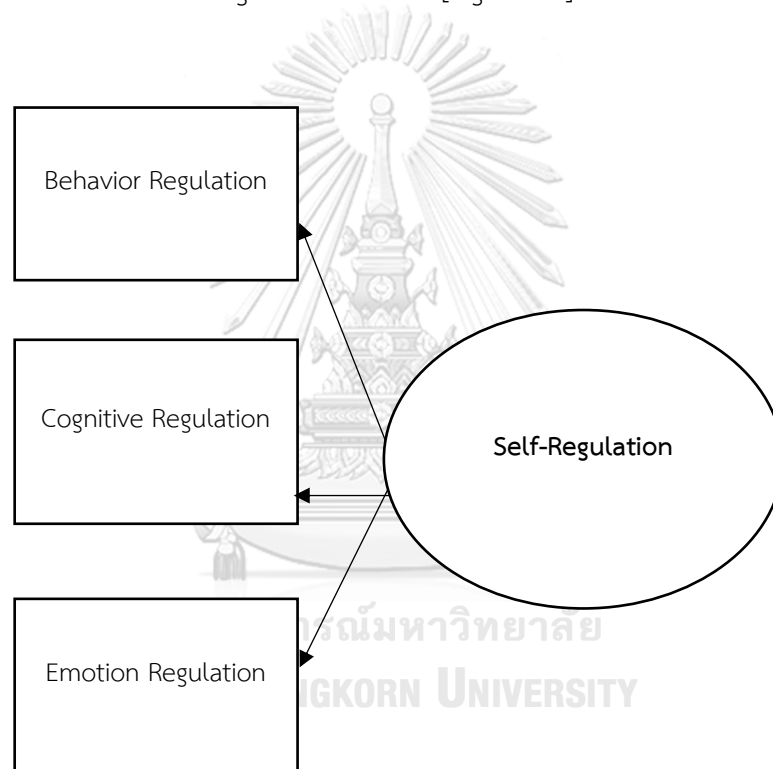


Figure 36 The determination of self-regulation model framework

Secondly, the uses of 70-20-10 learning and development model (Lombardo & Eichinger, 1996) which the proportion of learning is about 70% from on-the-job experiences and working on tasks and problems, 20% from feedback or working around good and bad examples of the need, and 10% from courses and reading.

This concept is related to the social cognitive theory, which expectations of personal efficacy are depended on several sources which are the performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1976). There is also the support finding from Moonlenburgh (2018) who considered the implications of neuroscience to gain attention and engagements among learner both the impacting the behavior change or skills development, feel others emotions, and learning consistently over time. The findings from relevant literature lead to the determination of social cognitive learning and development model [Figure 37].

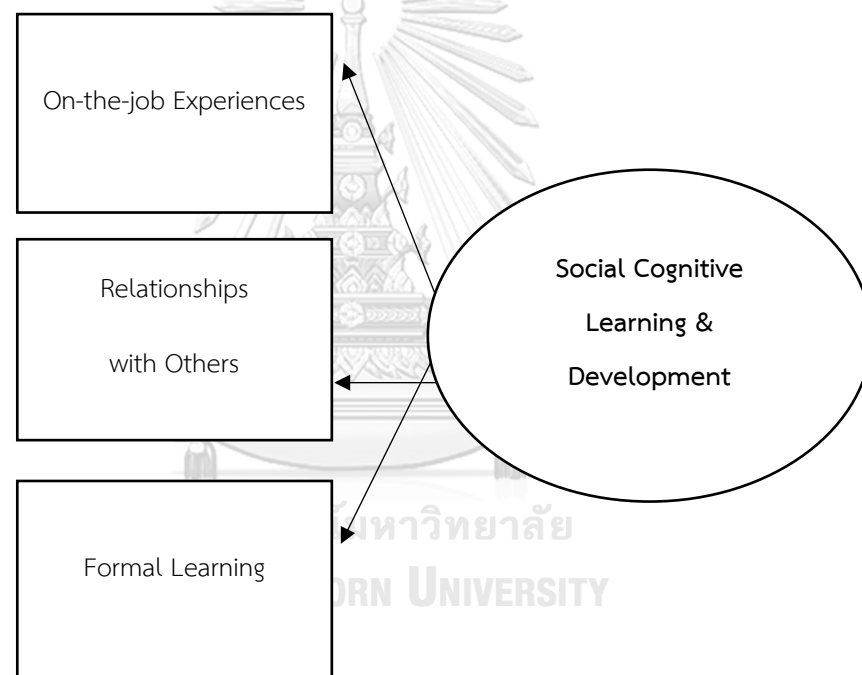


Figure 37 The determination of social cognitive learning and development model framework

Thirdly, in the social and emotional learning perspective, the influence of social and emotions is associated in learning. The Socioemotional Selectivity Theory emphasized the importance of social partner as a social motivation drive Carstensen (1992); Carstensen, Fung, Charles, et al. (2003); (Dudley & Multhaup, 2005) While the

dimension of tie-strength is considered as one of the factors in professional learning and it is defined as a relationship to others in social and emotional learning. For example, "closeness" of a relationship. Marsden and Campbell (1984). In the form of collaborative in organizational groups, J. P. Davis (2016) revealed the “group cycling” in a small group, decomposed innovative activities which interlinked between different pairs of partners, and managed third-party interests across time and there is the expansion of internet use and the constant growth of digital online notion of tie-strength Goldenberg and Gross (2020); Petróczi et al. (2007). The findings from relevant literature lead to the determination of social cognitive learning and development model [Figure 38].

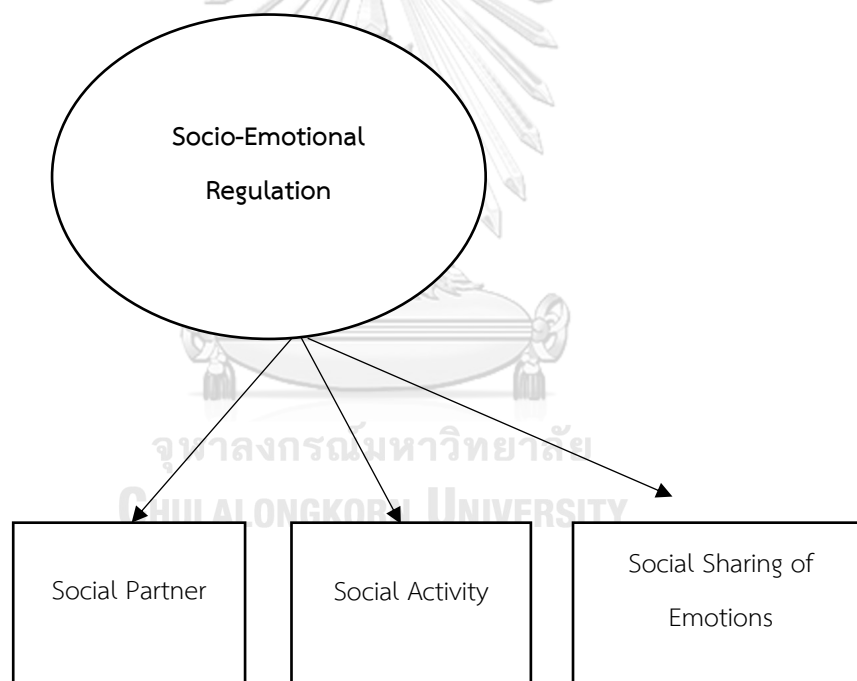


Figure 38 The determination of socio-emotional regulation model framework

The influences of Social and emotional learning (SEL) Competencies has been introduced by the (Collaborative for Academic, 2017). The CASEL competency framework developed by the Collaborative for Academic, Social, and Emotional Learning is the most cited framework for Social and Emotional Learning. The

framework revealed the relationship between 3 domains which are the classroom setting expanding to the schools, home, and the community's level. The social and emotional learning competencies comprise 5 domains of category; self-awareness, self-management, social awareness, relationship skills, and responsible decision making. This study we aimed to adopted the CASEL framework to develop the measurement model by using these 5 observed variables [Figure 39].

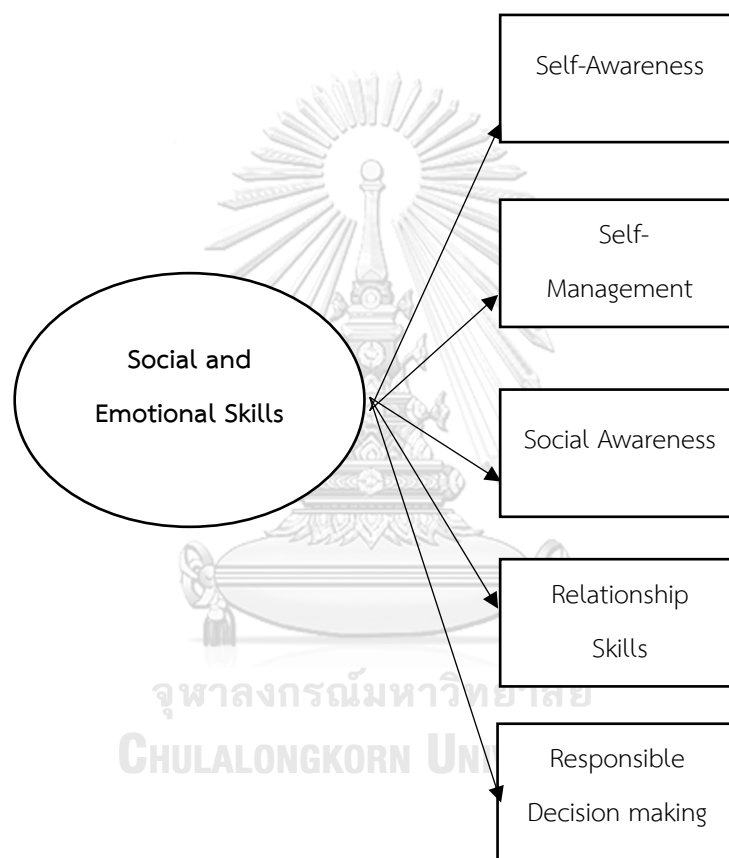


Figure 39 The influences of social and emotional skills model framework

Next, we have found that the factor of “grit” which is determines as the perseverance of long term goal which trait-level is composed of the consistency of interest and the perseverance of effort. Angela Lee Duckworth and Quinn (2009) defined two structure factors extracted from a subset of items from the Grit–Original Scale. Researcher also reported the model fit of 2 trait-level (8 items scale) and the

internal consistency, test–retest stability, and predictive validity of its scale among different samples of children and adult’s population [Figure 40].

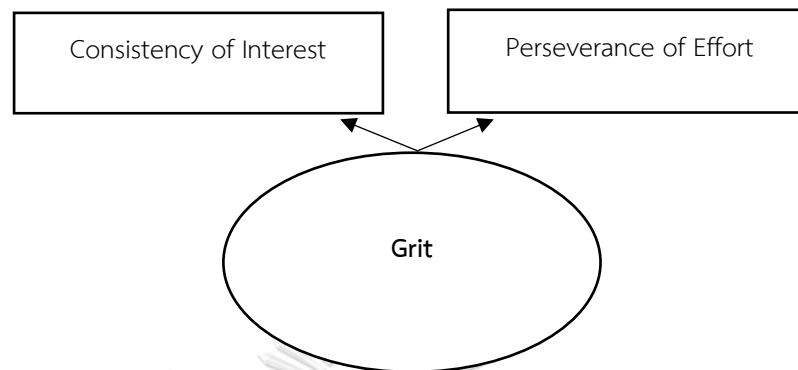


Figure 40 The influences of social and emotional skills model framework

Lastly, at the assumptions of three social levels: self, co, and socially shared regulation of learning. As learners regulate themselves by applying strategies to regulate their own learning for the sake of their own success. Learners can also be supported from group members or guide other at co-level and solving problem together by jointly develop understanding on those topics at shared-level (Greisel et al., 2018). While Järvelä et al. (2015) stated that shared regulation composes of four recursive phases which are; planning to establish group’s goals and standard, monitoring which group members compare the procedure they are working, evaluating is to determine the group standards, and the regulating phase which they are making the changes needed to fix the gap between the group standards and their final product. Lehraus and Marcoux (2018) revealed the co-regulation process during the cooperative classroom setting which social mediation is viewed as the role of collaboration to participate in the learning community. Individuals can shape their learning using the human cognition and socially constructed, and also processed and distributed between persons and tools. Social regulation is recognized as a factor that lead from hetero-regulation to self-regulation which teachers play the important

role to regulate learners in classroom situations. This can be implied that learners have to regulate at individual-level first in order to join the social group and reach the social standard. So that the successful socially-shared learner may be developed from the well behavior, cognitive, and emotion regulated learners.

Järvelä et al. (2015) investigated the socially shared regulation in the collaborative learning groups using the various tools. Allal (2018) reported that in the past, the dimensions of cognitive writing falls into four directions involving the cognitive process in writing tasks, the sociocognitive factors as a reader-based feedback from mentors and peers, and lastly the co-constitution of cognitive of social processes and the sociodiscursive dimensions. The co-regulation model proposed in this study includes of three sources of regulation; the structure of teaching/learning situation, teacher's interventions and interactions with students, and the interactions between student's which student learning process of self-regulation (cognitive, metacognitive, motivational...) is linking to their peer. The sessions were following the preparation stage, the production of draft and the revision of the draft. According to the prior studies, the share-reflection can be a possibly mediator that will support socially-shared learners develop the social-emotional comprehension.

Molinillo, Aguilar-Illescas, Anaya-Sánchez, and Vallespín-Arán (2018) conducted a study of impacts of interactions, social presence and emotional engagement on active collaborative learning in a social web-based environment. The results from structural equation modeling (SEM) showed that the proposed model has a good predictive capacity. The result also revealed that social presence and teacher-student interaction have a positive influence in students active learning both directly and indirectly through emotional engagement, while student-student has less significant impact on active learning.

Lastly, Social and Emotional Skills could be possibly lead peoples' grit. As the social and emotional skills are included with the self- and social- factors and integrally related to grit. Self-awareness, self-management, social awareness could be related to the perseverance of effort. Werner et al. (2019) have found that there are the overlapping between the components of grit and trait self-control which also associated with academic, career exploration, and talent development (Datu et al., 2017). Whilst relationship skills and responsible decision may related to the consistency of interest which Isenberg, Brown, DeSantis, Veloski, and Hojat (2020) have found the positively significantly correlation ($p < 0.01$) between grit and self-esteem ($r = 0.35$), empathy ($r = 0.26$), and its activity ($r = 0.17$). In summary, the findings from relevant literature lead to the determination of path analysis model below [Figure 41].

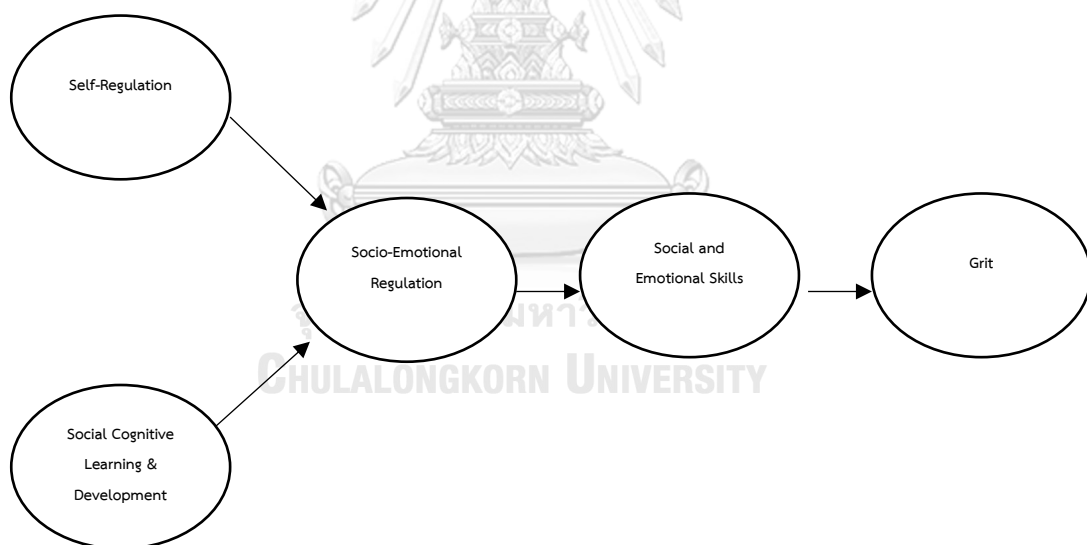


Figure 41 The path analysis model framework

Theoretical Model Framework

Overall literature review has shown the possibility of the research model whether to test the proposed casual model of socially-shared regulation produces a population covariance matrix that is consistent with the sample covariance matrix.

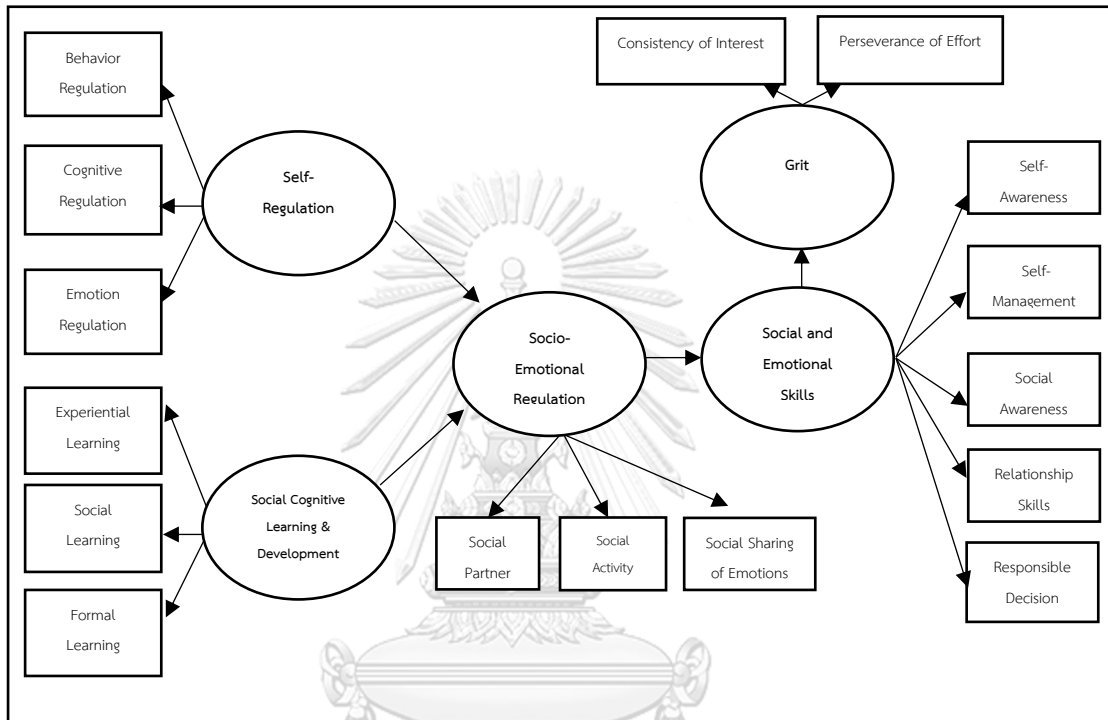


Figure 42 The theoretical model framework

CHAPTER III

METHODOLOGY

Chapter Overview

The research titled “A Learning and development with collaborative note-taking model for enhancing higher education students’ workforce skills in socio-emotional regulation and grit based on a web 5.0 approach” was the research and development (R&D) using a multi-method approach. According to the study, the researcher has divided the study into three main phases following the research objectives;

Phase 1: To investigate the socio-emotional regulation framework to promote higher education students' future workforce skills in social and emotional regulation and grit.

Phase 2: To investigate how socio-emotional regulation impacts grit based on the instructional technology via online social collaborative note-taking in the web 5.0.

Phase 3: To define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

The sub-processes under the three main objectives using a multi-method approach are presented in fig 43.

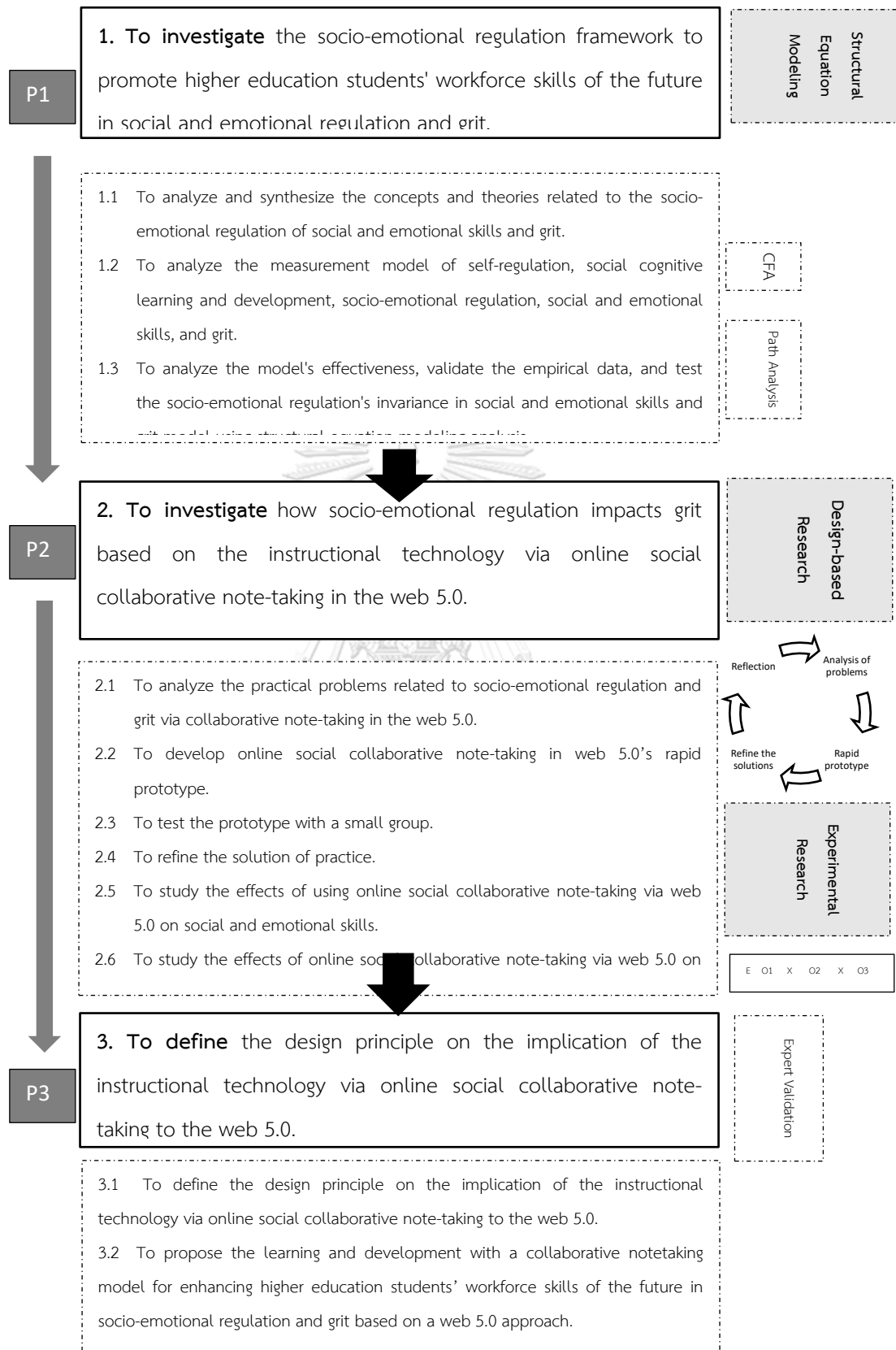


Figure 43 The multi-methods of research and development (R&D)

The dissertation has been approved by the research ethics review with Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University (Expedited review COA No.243/2563).

Phase 1: To investigate the socio-emotional regulation framework to promote higher education students' future workforce skills in social and emotional regulation and grit.

The objective of phase 1 is to investigate the socio-emotional regulation framework to promote social and emotional and grit using the structural equation modeling (SEM) approach.

. There are three sub-objectives following:

- 1.1 To analyze and synthesize the concepts and theories related to the socio-emotional regulation of social and emotional skills and grit.
- 1.2 To analyze the measurement model of self-regulation, social cognitive learning and development, socio-emotional regulation, social and emotional skills, and grit.
- 1.3 To analyze the model's effectiveness, validate the empirical data, and test the invariance of socio-emotional regulation in social and emotional skills and grit model using structural equation modeling analysis.

with the details of the research procedures as follows;

1.1 Population

The population used in the survey is the graduate students in higher education institutes under the Ministry of Higher Education, Science, Research and Innovation at the Graduate Diploma, Master Degree, Higher Graduate Diploma, and

Doctoral Degree with a total number of 1,555,214 people (Ministry of Higher Education, 2019)

1.2 Participants

According to J. F. Hair, Black, Babin, and Anderson (2010), the minimum problem with deviations from normality is 20 respondents for each parameter. In this study, 350 graduate students will be recruited to take the questionnaire (according to the research model, there are estimated maximum five parameters for each measurement models and six parameters for structural equation modeling).

For the probability sampling, multi-stage random sampling is used with the following procedure:

- 1.2.1.1 Using a stratified random sampling of those who currently study in blended or online programs during the pandemic (Master's and Doctoral degree with 1:1 ratio), the estimated participant was 175 each.
- 1.2.1.2 Using convenient sampling to specify participant universities based on the following criteria; a public school and a private university in Thailand under the ministry of higher education, science, research, and innovation, the disciplines fall into social and human sciences, or science and technology, or health science.

Eighth teen universities out of 4 regions in Thailand that meet the above criteria are accepted.

Table 14 The convenient sampling of participant universities

Region	Participant Universities/ Institutes
North region	.Mae Fah Luang University, Chiang Rai .Chiang Mai University, Chiang Mai

Region	Participant Universities/ Institutes
	<ul style="list-style-type: none"> .University of Phayao Muang Phayao .Maejo University, Chiang Mai
Northeast region	<ul style="list-style-type: none"> .Mahasarakham University, Maha Sarakham .Suranaree University of Technology, Nakhon Ratchasima .Khon Kaen University, Khon Kaen .Ubon Ratchathani University, Ubon Ratchathani
Central region	<ul style="list-style-type: none"> .Chulalongkorn University, Bangkok .King Mongkut's Institute of Technology Ladkrabang, Bangkok .Mahidol University, Nakhon Pathom .King Mongkut's Institute of Technology Ladkrabang, Bangkok .Ramkhamhaeng University, Bangkok .Sukhothai Thammathirat Open University, Nonthaburi
Southern region	<ul style="list-style-type: none"> .Walailak University, Nakhon Si Thammarat . Nakhon Si Thammarat Rajabhat University, Nakhon Si Thammarat .Prince of Songkla University, Songkhla .Thaksin University, Songkhla

1.3 Instruments

In this phase, the 5-point Likert scale of socio-emotional regulation in social and emotional learning and grit self-report questionnaire is used to employ the quantitative data.

1.4 Validity and Reliability of the Instrument

1.4.1 Socio-emotional regulation in social and emotional skills and grit self-report questionnaire

1.4.1.1 Analyzing the and synthetizing the literatures and related research.

1.4.1.2 Defining the structure of the socio-emotional regulation in social and emotional skills and grit self-report questionnaire, the items are set into three parts which are Part 1 General information about the respondents, amount 15 questions. Part 2 level of support requirements and the relationship in the thesis, totaling 8 questions. Part 3 Levels of socio-emotional regulation behaviors, amount of 50 questions.

The five ratings range from 1) strongly disagree, 2) disagree, 3) neutral, 4) agree, and 5) strongly agree Interpretation, the interpretation criteria of frequency of behavior, perceptions, and opinion levels scores is where;

- 1 is defined as “Strongly Disagree”
- 2 is defined as “Disagree”
- 3 is defined as “Neutral”
- 4 is defined as “Agree”
- 5 is defined as “Strongly Agree”

The proposed structure of the self-report questionnaire of frequency behavior, perceptions, and opinion levels has 50 observed variables (items) to measure all variables. The structure of variables to be measured and the number of items in the questionnaire is as follows: [details in appendix]

Table 15 Socio-emotional regulation in social and emotional skills and grit self-report questionnaire structure

Variables	Part	Number of Items
General information	1	15

Variables	Part	Number of Items
Level of support requirements and the relationship	2	8
Levels of socio-emotional regulation	3	50
	Total	73

1.4.1.3 Bringing the self-report questionnaire to have five experts (2 experts in educational technology and communications, 1 expert in neurology or social psychology, 1 expert in educational research and educational measurement and evaluation, and 1 expert in teaching English or linguistics to check the content validity using item objective congruence (IOC) index, the acceptance criteria must be greater than 0.5

The criteria for evaluating content validity following;

+1 is defined as ensuring that the questions are measured in accordance with the content, definition, and purpose.

-1 is defined as uncertain that the questions are measured in accordance with the content, definition, and purpose.

0 is defined as that the questions are measured is not in accordance with the content, definition, and purpose.

1.4.1.4 Improving the self-report questionnaire by modifying some items according to the recommendations of experts for further data collection.

1.4.1.5 Validating the reliability of the tool by calculating the Cronbach's alpha coefficient classified by variable from tryout data of 30 samples of graduate students.

Five experts used the item objective congruence index (IOC) to assess the content validity score after the subscales were translated into Thai. All the items are considered with an acceptable rate (IOC greater than 0.5). The Cronbach's α for a small group tryout were ranged from .326 to .941. There were several suggestions to improve the subscale, as indicated in the appendix.

1.5 Data Collection

1.5.1 Analyzing and synthesizing the concepts and theories related to the socio-emotional regulation in social and emotional skills and grit.

1.5.2 Developing and sending the questionnaire to the participant universities to collect data.

1.5.3 Asking participants to sign the letter of consent after they have been notified of the details of the rationale, and the research objectives, details of the stages and agree to participate in the research.

It details the roles of stakeholders in the different departments, the criteria for selecting research participants, and the criteria for removing research participants from the rights and data privacy are as follows

1.5.3.1 Role of the participant

1.5.3.1.1 Role of respondents

Before participants join the project, they will be informed why this research project is being conducted and what it involves. Participants are invited to take part in this research because they are graduate students with a

total number of 800 research participants. The total time required for participation is approximately 20-30 minutes. Then the graduate students will be asked to complete the self-report questionnaire. The questionnaire can be either in the form of an online survey or paperback.

1.5.3.1.2 Role of the researcher

The researchers agreed on the role of the participants in collecting data in the university according to all the qualifications the researcher has provided. The researcher will then make a formal letter to the head director asking for help in collecting information from graduate students. The researcher will coordinate with the faculty department to make an appointment to collect information and give participants a consent letter. After receiving the consent, the questionnaire will be sent for completion. The researcher also takes the role of helping students when asking questions. The researcher also informed that it can be done at any time if the research participants wish to withdraw from the survey.

1.5.3.2 Criteria for the selection of research participants and criteria for the withdrawal of the research participants from the project, etc.

The criteria for the selection of research participants: see 1.2.1.3

The criteria for withdrawing research participants from the project may be considered in 2 cases:

1. By observing if participants show discomfort while answering the questionnaire. The researcher will notify that the student has the right to withdraw from this program at anytime. And not participating in or

withdrawing from this research program. This will not affect students in any way

2. By considering from the participants' survey answers, after completing the questionnaire, if there are students who do not complete the questionnaire. However, the number of lost data will not exceed 5% of the number of total respondents. Secondly, researcher will look at the pattern of no response, if it was found that there was no exact pattern. It can be assumed that this is caused by forgetting to answer the main reason. However, the researcher planned that if a questionnaire has less than 5 % of respondents received, then the listwise deletion will be employed for handling missing data that compute values based on data from only complete cases. If the number exceeds 5%, replace the lost data with the mean imputation of the variable (J. F. Hair et al., 2010). The researcher has specified a preliminary agreement that the respondents sincerely provide information. However, if the researcher finds an abnormality in the data processing, the researcher will remove the questionnaire under the terms of the number of statistically acceptable samples.

1.5.3.3 Details on how to contact and how to reach research participants.

Researcher contacts and coordinates with the faculty in each region regarding the timing. To enable the faculty and research participants to know and understand the research objectives. Procedures for collecting information and details prior to collecting the information as required. Before entering the data collection, the researcher makes an official letter for permission to the faculty to reach research participants while collecting data. The research team will attend with the instructors in that school. The consent form will be launched after the communication from the instructor or researcher. In

describing the rights of the participants in this research, the researcher will explain the research objectives and clarify the right of research participants to accept or refuse to participate. If participants are not comfortable, they can stop answering surveys at any time.

1.5.3.4 Protection of rights and maintaining the confidentiality of the research participants

Before answering this questionnaire, the consent of the research participants will be provided. In addition, participants are provided with preliminary information that withdrawal from the survey can be done at any time. Answers do not affect their study. Personal information will be kept confidential and will not be revealed to the public as information about an individual. The research result will be reported collectively. People who will have the right to access information will be those who are involved with this research and the Research Ethics Review Committee for Research Involving Human Subjects only. Data will be used for data analysis for a period of 1 year (throughout the project period). The researcher will destroy the information about you, together with other information, after the research is completed.

The information for the research participants following:

1. The research objectives, duration of the research period, and the total number of the research participants.
2. If some statements are unclear, participants may ask or require further information.
3. If participants have decided to take part in this research project, the researcher will ask for permission to collect information (by recording voice and videos) at an interview, a focus group meeting, and/or from the

questionnaires that will be used for data analysis for a period of 1 year (throughout the project period).

4. The researcher will destroy the information, together with other information, after the research is completed.
5. If participants feel uneasy or somewhat unhappy with some questions, they have the right not to answer them, including the right to withdraw from the research project without advance notification.
6. Participants' personal information will be kept confidential and will not be revealed to the public as information about an individual.
7. There is no cost for this research.
8. If participants have any questions, at all times, they can make further inquiries by contacting the researcher.

1.5.4 Analyzing the measurement models of socio-emotional regulation in social and emotional skills and grit and the path model, which relates independently to dependent variables.

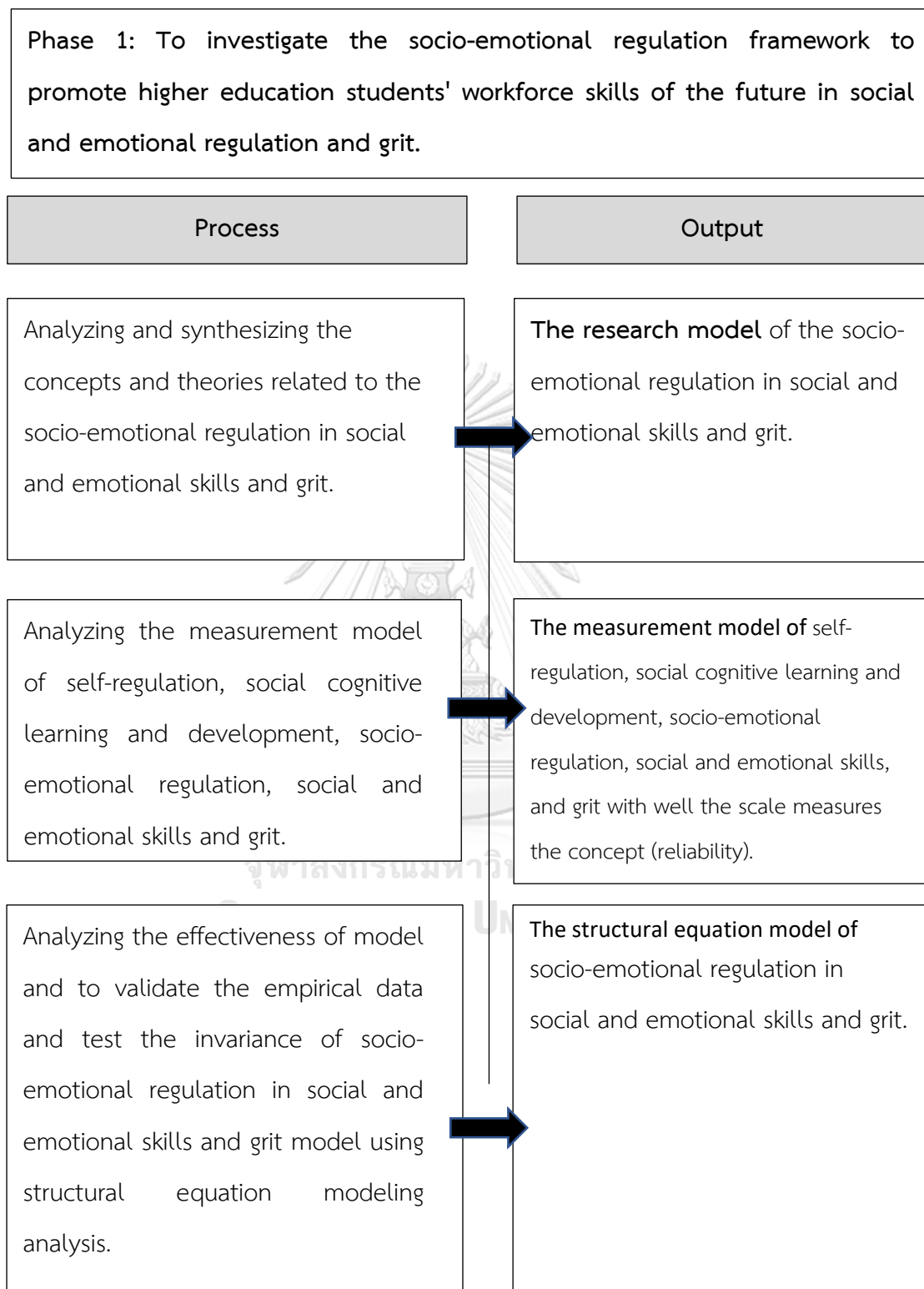
1.6 Data Analysis

1.5.5 Descriptive statistics, including frequency, mean, and standard deviation (SD), are used to reveal the interpretation of demographic with IBM SPSS Statistics.

1.5.6 Second-order confirmatory factor analysis (CFA) is used to interpret scales as multi-level to analyze the measurement model, then testing how well the scale can be measured the concept (reliability).

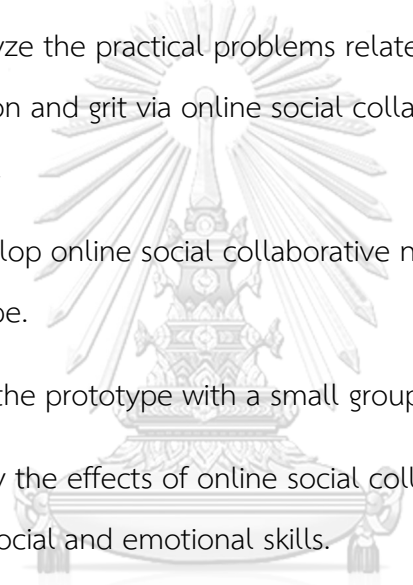
1.5.7 The structural model structural equation modeling (SEM) is used to analyze the model's effectiveness, validate the empirical data, and test the invariance of socio-emotional regulation in the social and emotional learning model with LISREL version 8.72.

Chart 1 The summary of Phase 1 process and output.



Phase 2: To investigate how socio-emotional regulation impacts grit based on the instructional technology via online social collaborative note-taking in the web 5.0.

The objective of phase 2 is to investigate how socio-emotional regulation impacts grit based on instructional technology via online social collaborative note-taking in the web 5.0, using a design-based research methodology. There were five sub-objectives following:

- 
- 2.1 To analyze the practical problems related to the socio-emotional regulation and grit via online social collaborative note-taking in the web 5.0.
 - 2.2 To develop online social collaborative note-taking in web 5.0's rapid prototype.
 - 2.3 To test the prototype with a small group.
 - 2.4 To study the effects of online social collaborative note-taking via web 5.0 on social and emotional skills.
 - 2.5 To study the effects of online social collaborative note-taking via web 5.0 on grit.
 - 2.6 To refine the solution of practice.
 - 2.7 To reflect to produce design principles to enhance solution implementation.

with the details of the research procedures as follows;

2.1 Population

The population used in this phase of study consists of the populations of experts and the population of users (graduate students).

The population of experts is the experts in the field of educational technology and communications or instructional web designer, computer science, neurology, and social psychology, educational research.

The population of users for a testing prototype was the graduate students in higher education institutes under the Ministry of Higher Education, Science, Research and Innovation at the Graduate Diploma, Master Degree, Higher Graduate Diploma, and Doctoral Degree, with a total number of 1,555,214 people (Ministry of Higher Education, 2019)

2.2 Participants

2.2.1 5 experts participated in analyzing the practical problems related to the SEL via web 5.0 activity and reflecting on producing design principles. The experts are from the following disciplines:

- 3 Experts in the field of educational technology and communications or instructional web designer, computer science.
- 1 Expert in the field of social psychology.

The criteria for selection are:

2.1.1.1 Having obtained a higher graduate diploma or doctoral degree

2.1.1.2 Having at least 2 years of experience in the field and/or having a strong academic work or having been recognized in those disciplines.

2.2.2 10 graduate students were recruited for a semi-structure empathize interview activity and testing prototype using purposive selection.

- 2.2.3 15 master's students from the department of Educational Technology and Communications, Faculty of Education, Chulalongkorn University, who recently enrolled in the academic year 2020, were recruited for the experiment.

2.3 Instruments

The nine research instruments used within this phase are as follows:

instruments used to employ the qualitative data

- 2.3.1 Semi-structure empathize interview

instruments used to employ the quantitative data

- 2.3.2 Usability observation form for users
- 2.3.3 Users' satisfaction survey
- 2.3.4 The 5-point Likert scale of socio-emotional regulation in social and emotional skills self-report questionnaire (previously developed in phase1).
- 2.3.5 The 5-point Likert scale of grit scale self-report questionnaire (previously developed in phase1).
- 2.3.6 The dissertation proposal assessment form (adopted from the Faculty of Education at Chulalongkorn University with internal used)

instruments used to experiment with users

- 2.3.7 The web 5.0 prototype
- 2.3.8 The web 5.0 users' guide
- 2.3.9 The learning and development activity plan

2.4 Validity and Reliability of the Instrument

Instruments used to employ the qualitative data

2.4.1 Semi-structure empathize interview

- 2.4.1.1 Analyzing and synthesizing the literature and related research.
- 2.4.1.2 Determining the questions based on the literature review. The semi-structured interview included 25 guided questions for graduate students and 13 guided questions for experts.
- 2.4.1.3 Bringing the interview form to the advisor to check the accuracy and content validity then improving according to the feedbacks.

2.4.2 Usability testing observation form for users

- 2.4.2.1 Determining the observational user testing guideline including functional testing, performance testing, and usability testing. The questions included: overall opinion, defining the three keywords of the tool, highlights /important benefits, weaknesses/ negative effects, functions that are useful to use, what seems to be overlooked, misunderstanding ambiguous or confused, the possibility of practical application, and additional suggestions, questions, and comments.
- 2.4.2.2 Bringing the usability testing observation form to the advisor to check the accuracy and content validity, then improve according to the feedback.

2.4.3 Usability testing and users' satisfaction survey

- 2.4.3.1 Analyzing and synthesizing the literature and related research.
- 2.4.3.2 Defining the structure of the Usability testing and users' satisfactions survey, the items are set into four parts which are:
1) usefulness, 2) efficiency, 3) effectiveness, 4) learnability, 5)

satisfaction, 6) accessibility, and 7) overall satisfaction (F. Davis, 1985; QuestionPro, 2020; Rubin & Chisnell, 2008; Venkatesh & Bala, 2008).

The five ratings range from 1) strongly disagree, 2) disagree, 3) neutral, 4) agree, and 5) strongly disagree Interpretation, the interpretation criteria of frequency of behavior, perceptions and opinion levels Scores is where;

- 1 is defined as “Strongly Disagree”
- 2 is defined as “Disagree”
- 3 is defined as “Neutral”
- 4 is defined as “Agree”
- 5 is defined as “Strongly Agree”

The proposed structure of the usability testing and users’ satisfaction survey has 30 items to measure all variables. The structure of variables to be measured and the number of items in the questionnaire are as follows:

Table 16 The usability testing and users’ satisfactions survey structure

Variables	Number of Items
Usefulness	5
Efficiency	5
Effectiveness	7
Learnability	4
Satisfaction	4
Accessibility	4
Overall satisfaction	1
Total	30

- 2.4.3.3 Bringing the self-report questionnaire to have 3 experts in educational technology and communications to check the content validity using the item objective congruence (IOC) index, the acceptance criteria must be greater than 0.5

The criteria for evaluating content validity following;

+1 is defined as ensuring that the questions are measured in accordance with the content, definition, and purpose.

-1 is defined as uncertain that the questions are measured in accordance with the content, definition, and purpose.

0 is defined as that the questions are measured is not in accordance with the content, definition, and purpose.

- 2.4.3.4 Improving the survey questionnaire by modifying some items according to the recommendations of experts for further data collection.

- 2.4.3.5 Validating the reliability of the tool by calculating the Cronbach's alpha coefficient classified by variable from tryout data of 30 sample graduate students.

Three experts used the item objective congruence index (IOC) to assess the content validity score after the subscales were translated into Thai. All the items are considered with an acceptable rate (IOC greater than 0.5). The Cronbach's α is ranged from .861 to .899.

Instruments used to experiment with users.

2.4.4 The web 5.0 prototype

- 2.4.4.1 Analyzing and synthesizing the literature and related research to form up the model components.
- 2.4.4.2 Developing wireframe based upon its component.

The proposed components of Web 5.0 reveal the features which will allow users to interact with content (Benito-Osorio et al., 2013; Martin de Diego et al., 2018) with the following dominant features; recognizing self-, managing tasks, social sharing, customizing workspace, and engaging community.

- 2.4.4.3 Developing the web 5.0 prototype based upon the wireframe.
- 2.4.4.4 Testing and the prototype with a small group and refining the solution of practice.
- 2.4.4.5 Reflecting to produce design principles to enhance solution implementation.

2.4.5 The web 5.0 users' guide

- 2.4.5.1 Developing the web 5.0 user's guide according to the web 5.0 product.
- 2.4.5.2 Bringing the web 5.0 user's guide to the advisor to check the efficiency of the guideline and then improve according to the feedback.
- 2.4.5.3 Improving the web 5.0 user's guide for the uses in further phase.

2.4.6 The learning and development activity plan

- 2.4.6.1 Analyzing the and synthesizing the literature and related research.

- 2.4.6.2 Designing the learning and development activity plan based on the analyzed and synthesized literature and related research and the model developed in phase 2.

The proposed structure of the learning and development activity structure is as follows:

Learning Plan for Seminar in Innovation and Educational Technology Course

Objective:

- Explain the importance of research (covering research problems and rationale)
- Define research questions, objectives, definitions, conceptual frameworks, research scope, and expected outcomes
- Review the theory and research involved in the literature review
- Design research methodology and action plans
- Make references in the correct format
- Write and prepare thesis proposal presentation

Teaching materials:

- Social-Emotional collaboration platform “Sociemo”
- Collaborative note-taking platform “Google Docs”

Main activities:

- Self-regulation in compliance with the tasks set to be achieved within the academic year 2021
- Set the group's shared goals according to the “Socially-Shared Regulation” guidelines. Brainstorm ideas to determine the workload to be completed

within the academic year 2021, according to their own goals, and formulate strategies and methods of online communication based on group learning and development principles under the 70:20:10 approach.

- Work closely with the group members (by the advisor) using socio-emotional regulation strategies. (Details in appendix)

2.4.6.3 Bringing the learning and development activity plan to have 3 experts (2 experts in educational technology and communications, 1 expert in neurology or social psychology) to check the content validity using the item objective congruence (IOC) index, the acceptable criteria must be greater than 0.5

2.4.6.4 Improving the learning and development activity plan according to the recommendations of experts for further data collection.

Three experts used the item objective congruence index (IOC) to assess the content validity score after the subscales were translated into Thai. All the items are considered with an acceptance rate (IOC greater than 0.5).

2.5 Data Collection

In this phase, the researcher adapted the design research approaches in educational technology (T. Reeves, 2006) with the analysis of practical problems, development of solutions informed by existing design principles and technological innovations, a cycle of testing and refinement, and reflection to produce design principle and enhance solution implementation.

2.5.1 Analyzing the practical problems related to the SEL via web 5.0 by interviewing 5 experts and empathize with 10 graduate students using a semi-structured empathizing interview and following the empathize process adapted from (Lucas, 2018)

1. Introduce yourself.
2. Introduce your project.
3. Ask names, where they come from. Ask about specific instances or occurrences (“Tell me about the last time..”)
4. Asking neutral questions like “What do you think about...?”
5. Exploring emotions like “Why do you feel...?” “What do you feel about...?”
6. Digging deeper into emotion and motivation. These help you understand user behavior and identify needs. With questions “Why?”, “Why did you do/say/think that?”, “Really? And why was that?”, “Can you say more about that?”, “Tell me more.”, “And what were you feeling then?”
7. Wrapping up.
 - 2.5.2 Developing wireframe and web 5.0 rapid prototype together with the draft model of learning and developing based upon the practical problems and literature review.
 - 2.5.3 Testing the prototype (1) with a small group of 10 Faculty of Education graduate students by this step using the usability testing observation form. In the first prototype testing, participants attempt to complete tasks with a user interface. Participants may think aloud, and the researcher may ask questions to better understand what they’re thinking and doing, but the primary value is in observing their actions. (Ross, 2018)
 - 2.5.4 Asking participants to sign the letter of consent after they have been notified of the details of the rationale and the research

objectives, details of the stages, and agree to take part in the research (see 1.5.3).

- 2.5.5 Testing the prototype (2) with a small group of 15 Faculty of Education graduate students (same group). By this step uses usability testing and users' satisfaction survey.
- 2.5.6 Refine the solution of practice and reflect to produce design principles to enhance solution implementation.
- 2.5.7 After the refinement, the Pre-Experimental Design will be conducted with the One-Shot Repeated Measured Design method.



Figure 44 The One-Group Pretest-Posttest Design

E represents the experimental group

X represents the treatment variable (web 5.0)

O₁-O₃ represents the test 1, test 2, test3

15 different participants will be asked to sign the letter of consent after they have been notified of the details of the rationale and the research objectives, details of the stages, and agree to take part in the research.

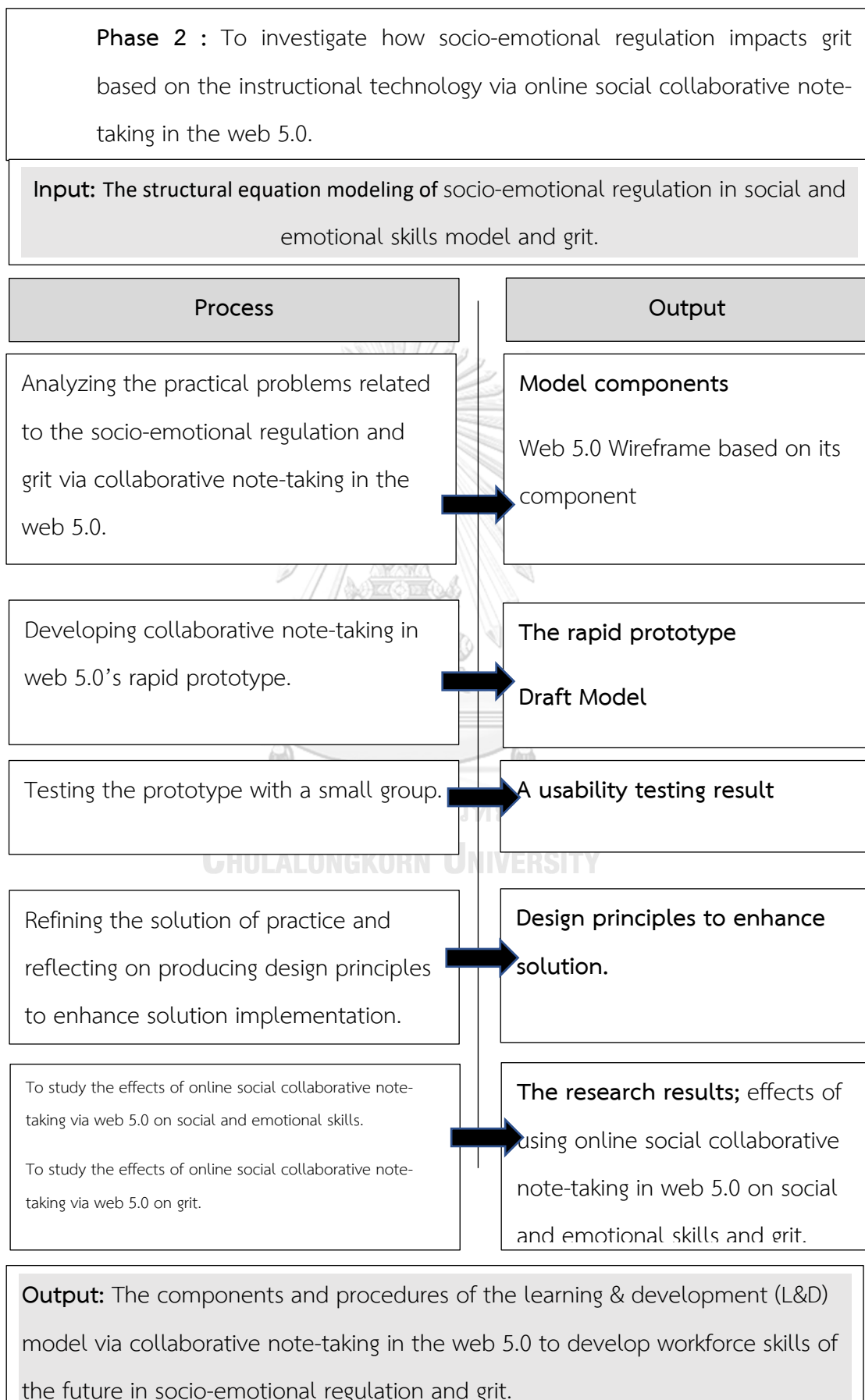
- 2.5.8 Having 15 participants complete the socio-emotional regulation in social and emotional learning and the grit scale self-report questionnaire.
- 2.5.9 Explain the web 5.0 system and provide the web 5.0 users' guide.

- 2.5.10 Have participants form a group (maximum of 5) including students from the same group of dissertation supervisors to support their project in identifying a research problem and question and searching relevant literature. The combination may be various.
- 2.5.11 Informing the learning and development activity.
- 2.5.12 After completing 12 weeks, have participants complete the socio-emotional regulation in social and emotional learning and the grit scale self-report questionnaire again.
- 2.5.13 Final revising of prototype and draft model and interpreting the results.

2.6 Data Analysis

- 2.6.1 Descriptive statistics, including frequency, mean, and standard deviation (SD), are used to reveal the interpretation of results.
- 2.6.2 Inferential statistics include repeated measures ANOVA to test the effects of using web 5.0 on the social and emotional skills and grit, repeated measures analysis of covariance to compare the mean at each level of the factor.

Chart 2 The summary of Phase 2 process and output.



Phase 3 : To define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

The objective in phase 3 is to study the experts' opinion on its implication to the web 5.0. There are 2 sub-objectives followings:

3.1 To define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

3.2 To propose the learning and development with collaborative notetaking model for enhancing higher education students' workforce skills of the future in socio-emotional regulation and grit based on a web 5.0 approach.

With the details of the research procedures are as follows;

3.1 Population

The population of experts was the experts in the field of educational technology and communications or instructional web designer, computer science, neurology, social psychology, educational research, and educational measurement and evaluation.

3.2 Participants

In this phase, 5 experts participated in analyzing the practical problems related to the SEL via web 5.0 activity and reflecting on producing design principles. The experts are from the following disciplines:

- 5 Experts in the field of educational technology and communications or instructional web designer, computer science.

The criteria for selection are:

1. Having obtained a higher graduate diploma or doctoral degree

2. Having at least 2 years of experiences in the field and/or having a strong academic work or have been recognized in those disciplines.

3.3 Instruments

instruments used to employ the quantitative data

3.3.1 The model evaluation form

3.4 Validity and Reliability of the Instrument

3.4.1 The model evaluation form

- 3.4.1.1 Analyzing the and synthesizing the literature and related research.
- 3.4.1.2 Defining the structure of the (draft) model evaluation form, the 15 items are set into four parts which are 1) usefulness, 2) Perceived ease of use, and 3) Attitude toward using adapted from (Holden & Karsh, 2010; Lee, Tsao, & Chang, 2015).

The five ratings range from 1) strongly disagree, 2) disagree, 3) neutral, 4) agree, and 5) strongly disagree. Interpretation, the interpretation criteria of opinion levels is where;

1 is defined as “Strongly Disagree”

2 is defined as “Disagree”

3 is defined as “Neutral”

4 is defined as “Agree”

5 is defined as “Strongly Agree”

The proposed structure of the model evaluation form has 15 items to measure all variables. The structure of variables to be measured and the number of items in the questionnaire are as follow:

Table 17 The model evaluation form structure

Variables	Part	Number of Items
Perceived Usefulness	1	5
Perceived Ease of Use	2	5
Attitude toward using	3	5
	Total	15

3.4.1.3 Bringing the evaluation form to have 3 experts in educational technology and communications to check the content validity using the item objective congruence (IOC) index, the acceptance criteria must be greater than 0.5

3.4.1.4 Improving the evaluation questionnaire by modifying some items according to the recommendations of experts for further data collection.

Three experts used the item objective congruence index (IOC) to assess the content validity score after the subscales were translated into Thai. All the items are considered with an acceptable rate (IOC greater than 0.5).

3.5 Data Collection

3.5.1 Focus group with 5 experts to study the experts' opinion on its implication to the web 5.0.

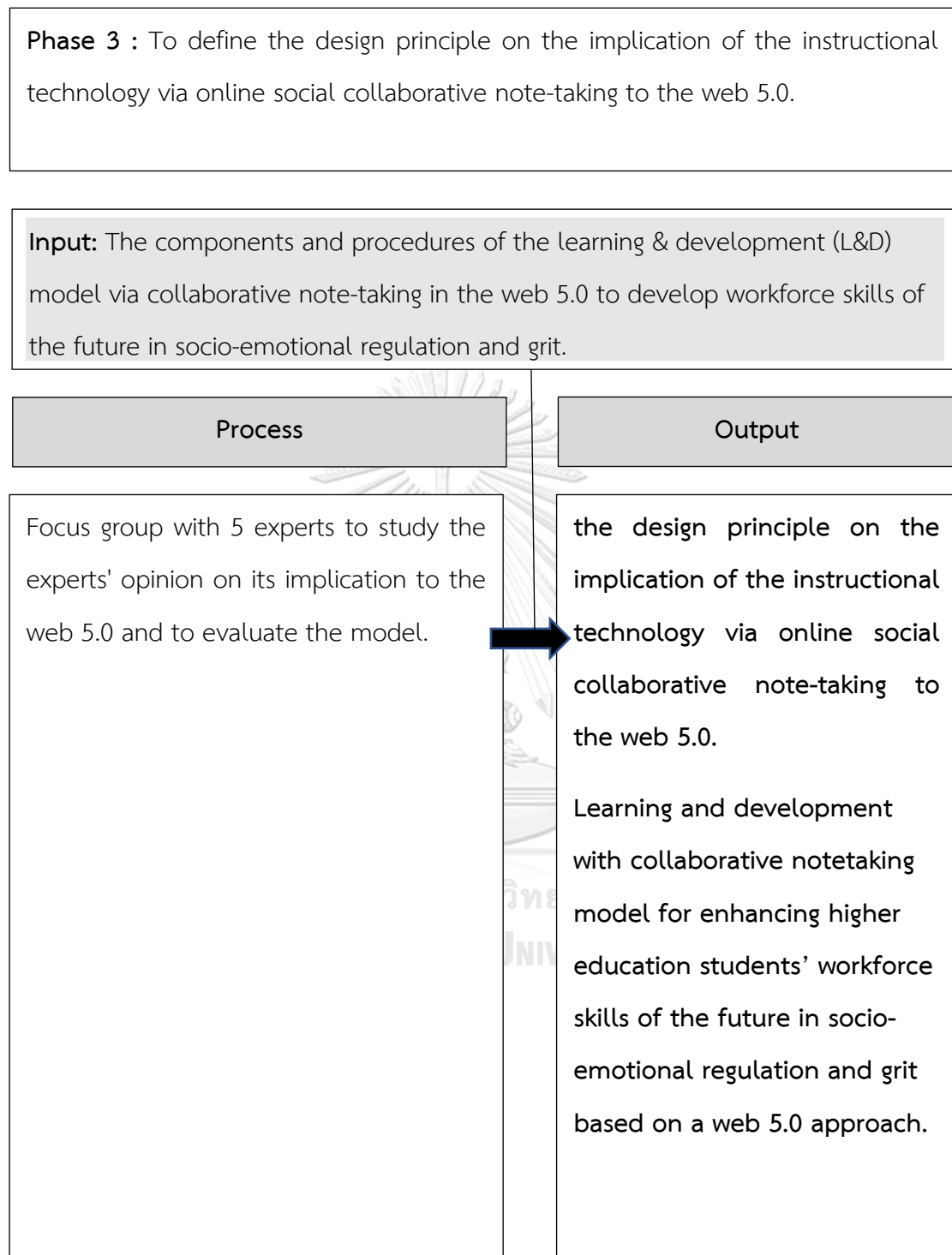
3.5.2 Having 5 experts evaluate the learning and development with a collaborative notetaking model for enhancing higher education students' workforce skills of the future in socio-emotional regulation and grit based upon the implication to the web 5.0.

3.6 Data Analysis

3.6.1 Descriptive statistics, including frequency, mean, and standard deviation (SD), are used to reveal the interpretation of results.



Chart 3 The summary of Phase 3 process and output.



CHAPTER IV

RESEARCH FINDINGS

Chapter Overview

The research titled “A Learning and development with a collaborative note-taking model for enhancing higher education students’ workforce skills in socio-emotional regulation and grit based on a web 5.0 approach” was conducted in the three phases.

Phase 1: To investigate the socio-emotional regulation framework to promote higher education students' future workforce skills in social and emotional regulation and grit.

Phase 2: To investigate how socio-emotional regulation impacts grit based on the instructional technology via online social collaborative note-taking in the web 5.0.

Phase 3: the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

The findings of this study were aligned with three objectives: to investigate the socio-emotional regulation framework, to investigate how socio-emotional regulation impacts grit based on instructional technology via online social collaborative note-taking in the web 5.0., and to define the design principle on the implication. This report presents the finding step-by-step as follows these following guidelines:

- Measurement and structural equation model
(socio-emotional regulation framework)

- Structural relationship between socio-emotional regulation, social and emotional skills (SEL), and grit
- The experimental platform
 - The experimental platform "SOCIEMO"
- The instructional design model
 - The learning and development model
 - The Instructional Design model

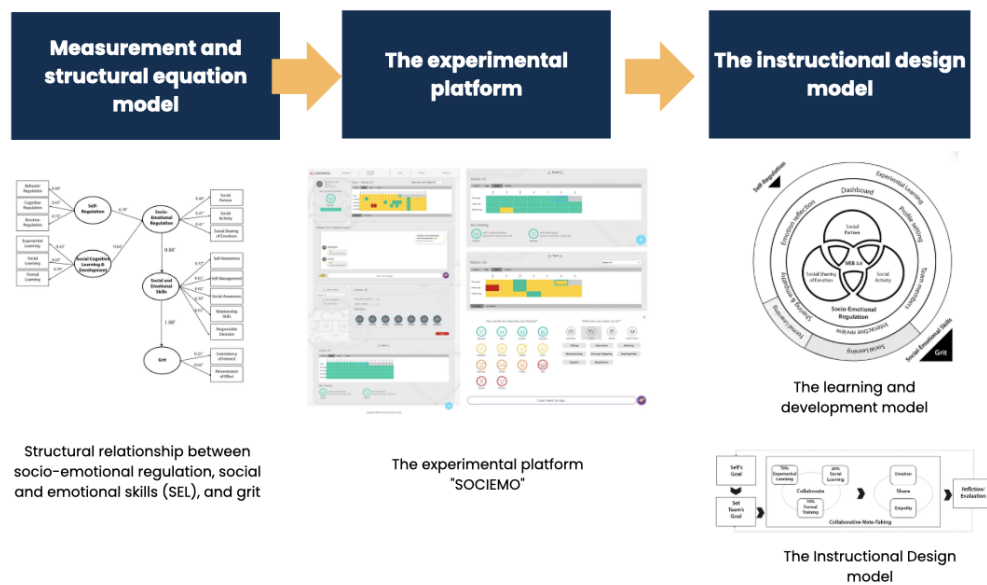


Figure 45 The three main findings of the study

4.1 The result of the investigation of socio-emotional regulation framework to promote higher education students' workforce skills of the future in social and emotional regulation, and grit (Phase 1).

4.1.1 The concepts and theories related to the socio-emotional regulation in social and emotional skills and grit.

4.1.1.1 Theoretical roots and predictions

Self-regulation and social cognitive learning

Previously, research has focused on self-regulated learning based on the concept of helping learners develop their own learning pace through self-regulation strategies (Zimmerman et al., 2009). At the individual level, self-regulation strategies for behavior, emotions, and cognition were developed. Therefore, regulation of one's self may contain three factors which are behavior regulation, cognitive regulation, and emotion regulation (Ifenthaler, 2012). Behavior Regulation influences one's thoughts, feelings, and actions by adjusting performance processes toward strategies. Cognitive regulation influences one is monitoring and adjusting of the cognitive and emotional states. Emotion regulation influences one's emotion recognition and emotion regulation which can change the individual's current emotional state.

Originating from Zimmerman (1989)'s Triadic model of self-regulation learning, which followed a social cognitive perspective, self-regulation is defined as the distinctive interaction of personal, behavioral, and triadic environment processes. This concept is related to the social cognitive theory in which personal efficacy expectations depend on several sources; performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1991). This creates self-understanding, emotional understanding, and awareness of how the self relates to others in social competence (Thompson, 2007).

Between social cognitive learning, the uses of 70-20-10 learning and development models (Lombardo & Eichinger, 1996), the proportion of learning is about 70% from on-the-job experiences as well as working on tasks and problems, 20% from feedback or working around good and bad examples of needs, and 10% have arisen from courses and reading (Bingham & Conner, 2010; Johnson et al., 2018). This can all be attributed to ubiquitous learning, not just in formal settings such as seminars, classrooms, or other structured learning environments. Working with others, asking colleagues questions, and observing experienced people follow a vocational

path are examples of how learning may happen in the workplace (Littlejohn et al., 2019).

Socio-emotional regulation

The second theory embedded in the study was the socioemotional selectivity theory which emphasized the importance of social partners as a social motivation drive and its relation to one of two categories. These include the acquisition of knowledge and emotion regulation (Carstensen, 1992). In this study, we synthesized the factors from the category of socioemotional selectivity, which is comprised of essential factors such as social partners, social activities, and social sharing of emotion. In this study, socio-emotional regulation will be defined as the regulation of behavior, emotions, and social cognition that influences task performance and collaborative problem solving by developing an understanding of topics at shared-level in a collaborative learning group (De Backer et al., 2018; Greisel et al., 2018; Järvelä et al., 2015).

According to previous research about social partners, it has been found that people in late adolescence (at the undergraduate level). Early adulthood tends to acquire knowledge rather than regulate their emotional states, while those in adulthood consider the selection of a social partner whom they are satisfied due to having fewer social connections (Carstensen, Fung, & Charles, 2003; Dudley & Multhaup, 2005). The empirical findings revealed that self and others merge entirely in empathy (Decety & Batson, 2009).

Culver and Bertram (2017) point out that students in higher education and early career academics may encounter numerous obstacles and have difficulty completing their degrees. They suggested the use of social learning theory via group activities and processes to lead to the development of new or stronger identities in graduate students' groups. J. P. Davis (2016) found that small group cycling and

deconstructed inventive activities were interconnected between distinct sets of partners. They then handled third-party interests through time through collaboration in organizational groups. Frey, Lohmeier, Lee, and Tollefson (2006) proposed a five-level scale to assess collaboration among grant partners and to re-evaluate the integration of the team's processes, structures, and goals.

Besides social partners and activities, there is the expansion of internet use and the constant growth of the digital online notion of digital emotion contagion and tie-strength Goldenberg and Gross (2020); Petróczi et al. (2007). The notion of social sharing of emotion is defined as individuals freely interacting with one or more others about the circumstances of an emotion-eliciting event, as well as their feelings and emotional reactions, and this happens regardless of age or gender (Rimé, 2009). This concept is also associated with the future of the concept of emotional intelligence. Regarding this, emotional, personal, and social intelligence can all be "positioned" differently with one another. Mayer, Caruso, and Salovey (2016) defined a mental ability in a four-branch model of emotion comprised of perceiving emotion, facilitating thought using emotion, understanding emotion, and managing emotion. Putting all the factors together, socio-emotional monitoring is an important regulatory process that can be monitored, controlled, and directed for successful collaborative learning strategies. (Näykki, Isohätälä, Järvelä, Pöysä-Tarhonen, & Häkkinen, 2017).

Social and emotional skills

In changing situations, social and emotional abilities include engaging and adjusting to new ways of thinking, working, and meeting with new people in diverse environments, as well as trust and compassion. Traditional social networks have adjusted to the new pace of technology, which requires the ability to act autonomously and respond to changes on the go (OECD, 2019). The influences of social and emotional learning (CASEL) competencies have been introduced by the

(Collaborative for Academic, 2017). The CASEEL framework has covered self-level skills, including self-awareness, self-management, and social-perspective-taking and social-level skills, including social awareness, relationship skills, and responsibility for decision-making which is necessary for learning. This can be applied not only to K-12 levels but also to early adults, middle-aged adults, and older adults. Molinillo et al. (2018) conducted a study on the impacts of interactions, social presence, and emotional engagement on active collaborative learning in a social web-based environment. The findings also demonstrated that social presence and teacher-student interaction have a positive impact on students' active learning, both directly and indirectly, through emotional involvement.

Grit

Individuals' perseverance and passion for long-term goals are accumulated through the professional learning route, a non-cognitive attribute known as grit (Angela Lee Duckworth & Quinn, 2009). Throughout their lifespans, grit can be used to predict of academic achievement, for example, in high school and higher education (Muenks, Wigfield, Yang, & O'Neal, 2016; Warren & Hale, 2020). In adulthood, grit has been proven to build steadily and predict cognitive performance in later life, especially leading to more of a positive influence on physical and emotional well-being based on the perseverance of effort (Rhodes & Giovannetti, 2021).

Social and Emotional Skills could lead to the development of peoples' grit. As social and emotional skills are included with the self-and social- factors and integrally related to grit. Self-awareness, self-management, and social awareness could be related to the perseverance of effort. According to Werner et al. (2019), it was found that there is an overlapping between the components of grit and the trait of self-control. Moreover, self-regulated learning may be a mediating pathway through which this aspect of grit is associated with improved academic outcomes

(Wolters & Hussain, 2015). Further, relationship skills and responsible decisions may be linked to the consistency of interest. Concerning this, Isenberg et al. (2020) found a positive significantly correlation between grit and self-esteem, empathy, and its activity, as well as grit and its linkage among social-emotional learning and emotional well-being (Datu & Restubog, 2020).

The identification of current theories, findings, and debates, as well as an assessment and nomination of the gaps in the literature relevant to self-regulation, social cognitive learning, socio-emotional regulation, social-emotional skills, and grit, are all used to provide a preliminary investigation within the research framework. The present study aims to incorporate these variables into the boarder study of grit, focusing on Thai graduate students, especially in the digital learning context (where they were studying in blended or online courses). As a result, this study hypothesized that socio-emotional regulation is significantly associated with social and emotional skills. In addition, social and emotional skills are significantly associated with grit as the intended goal. In summary, the findings from relevant literature led to the determination of the conceptual research framework below [see Fig. 46]. Accordingly, the main hypothesis can be divided into three following sub-hypotheses based on the research conceptual framework; H1: Self-regulation and social cognitive learning & development are significantly associated with the socio-emotional regulation, H2: Socio-emotional regulation is significantly associated with social and emotional skills, and H3: social and emotional skills are significantly associated with grit.

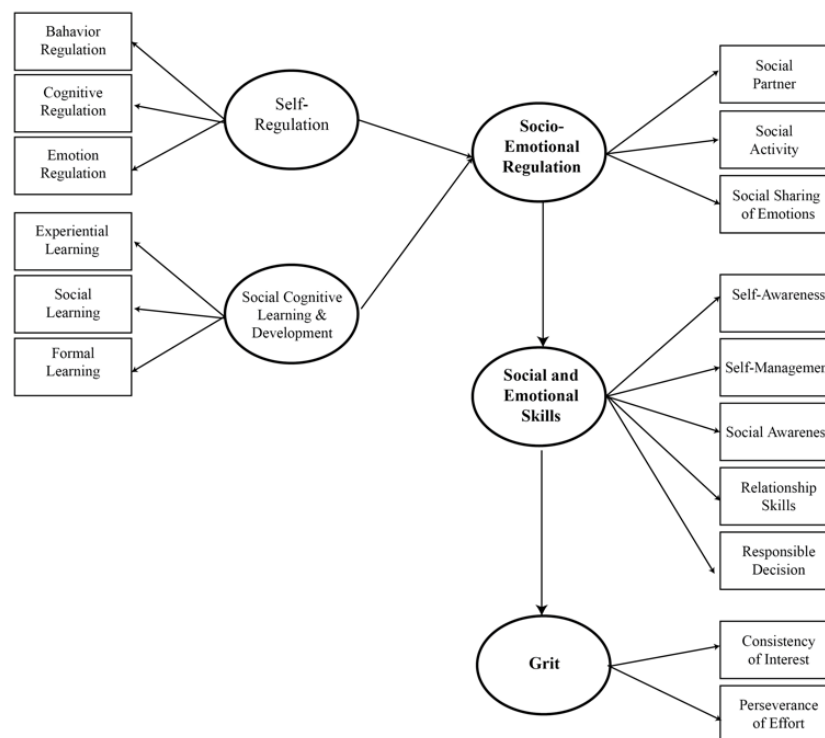


Figure 46 Preliminary investigations of the conceptual research model

4.1.2 The measurement model of self-regulation, social cognitive learning and development, socio-emotional regulation, social and emotional skills, and grit.

In this study, a total of 365 graduate students participated in the online survey, all of whom currently study in blended or online programs during the pandemic. All participants were recruited via convenience sampling to take the online self-report questionnaire. Participation is based on the following criteria; a public school and a private university in Thailand under the ministry of higher education, science, research, and innovation, the schools have a graduate program including at least 1 of these curriculums; graduate diploma, master degree, higher graduate diploma, and doctoral degree, the disciplines fall into social and human sciences, or science and technology, or health science.

Of the study, the participants included students enrolled in higher education courses as follows; 166 master's degrees (45.5%) and 199 doctoral degrees (54.5%). From the four regions of Thailand, there were 288 participants from the central (78.9%), 24 from the north (6.6%), 32 from the northeast (8.8%), and 21 from the south (5.8%). The ages ranged from 17-28 (n= 96, 26.3%), 29-40 (n= 193, 52.9%), above 40 (n= 76, 20.8%). Of the participants in this study, the disciplines were made up of 245 participants studying the social sciences and humanities (67.1%), followed by 62 studying health sciences (17.0%), and 58 studying sciences and technology (5.9%).

The participants were asked to complete an online questionnaire that included four demographic questions and 50 self-report questions. Several assessments were tailored to the study's environment to measure the significant aspects of the conceptual research model. Firstly, the nine items of the self-regulation scale, comprised of behavior, cognitive, and emotion regulation, were refined from the existing items (Brown et al., 1999; Garnefski & Kraaij, 2006; Herl et al., 1999; Howard & McGee, 2000). Secondly, the nine items of the social cognitive learning & development scale were based on the behaviors listed in the 70-20-10 model for learning and development (Bingham & Conner, 2010; Johnson et al., 2018; Lombardo & Eichinger, 1996). Thirdly, another nine items of the socio-emotional regulation scale were partly retrieved from three factors: social partner, social activity, and social sharing of emotions and were further refined from the existing items (Hofmann, Carpenter, & Curtiss, 2016; Järvelä & Hadwin, 2013; McCroskey & McCain, 1974; Stokes & Wilson, 1984). Next, fifteen social and emotional skills items were developed based on the capacities listed on the CASEL's core competence of five areas (Collaborative for Academic, 2017): self-awareness, self-management, social awareness, relationship skills, and responsible decision making. Lastly, eight items of the short grit scale (Grit-S) were adopted from (Angela Lee Duckworth & Quinn, 2009) with two structure factors: perseverance and passion for long-term goals. All items

were rated on a 5-point Likert scale ranging from 1 (hardly like my behavior) to 5 (most like my behavior).

Subsequently, confirmatory factor analysis (CFA) was employed because the scales used in this investigation had been adequately developed in earlier studies and validated their factor structures. Results from the CFA for all the measurement models showed overall good fits, in which Cronbach's α , chi-square (χ^2), df, root mean square of error approximation (RMSEA), and comparative fit index (CFI), and Tucker-Lewis index (TLI) were reported. The results showed that all the measurement models indicated an acceptable fit to the data, with the following model-fit criteria (Hair, Black, Babin, & Anderson, 2014; Schumacker & Lomax, 2015). All the data indicated RMSEA was less than or equal to .05, CFI was greater than 0.97, and TLI value was close to .95 [Table 18]. The significant factor loadings of sub-scales were presented in the appendix.

Table 18 Fit indices of the second-order confirmatory factor analysis

Factors	Cronbach's α	χ^2	df	RMSEA	FI	LI
CFA Self-Regulation	.861	27.597	22	0.026	.998	.997
CFA Social Cognitive	.889	25.386	18	0.034	.998	.996
CFA Socio-Emotional Regulation	.699	19.610	17	0.021	.998	.996
CFA Social-Emotional Skills	.941	74.471	61	0.025	.998	.998
CFA Grit	.326	17.016	11	0.039		

Factors	Cronbach's α	χ^2	df	RMSEA	FI	LI
			*			.995

χ^2 = Chi-Square statistic; df = degrees of freedom; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; * $p < .05$

4.1.3 The effectiveness of the model to validate the empirical data and test the invariance of socio-emotional regulation in social and emotional skills and grit model using structural equation modeling.

Structural model fitting

Firstly, the Pearson correlation coefficient was computed to assess the linear relationship between self-regulation, social cognitive learning & development, socio-emotional regulation, social and emotional skills, and grit. All factors were positively correlated. Especially the endogenous variables, which were strongly correlated with other variables, including SR and SES ($r = .663$, $p < .01$), SCL and SES ($r = .665$, $p < .01$), GRT and SES ($r = .661$, $p < .01$). The mean, standard deviation, and correlation coefficient values are presented in Table 19.

Table 19 Pearson correlation among the factors

	M	SD	1	2	3	4	5
SR	3.90	.60	1				
	4	0					
SCL	4.04	.67	.789**	1			
	3	7					
SER	3.55	.57	.613**		1		
	8	0		575**			

	M	SD	1	2	3	4	5
SES	3.96	.64	.663**	.	.	.	1
	3	1		665**	606**		
GRT	3.67	.63	.575**	.	.	.	1
	2	1		478**	591**	661**	

** All correlations are significant at the 0.01 level (2-tailed), Note: SR = Self-Regulation, SCL = Social Cognitive Learning & Development, SER = Socio-Emotional Regulation, SES = Social and Emotional Skills, GRT = Grit

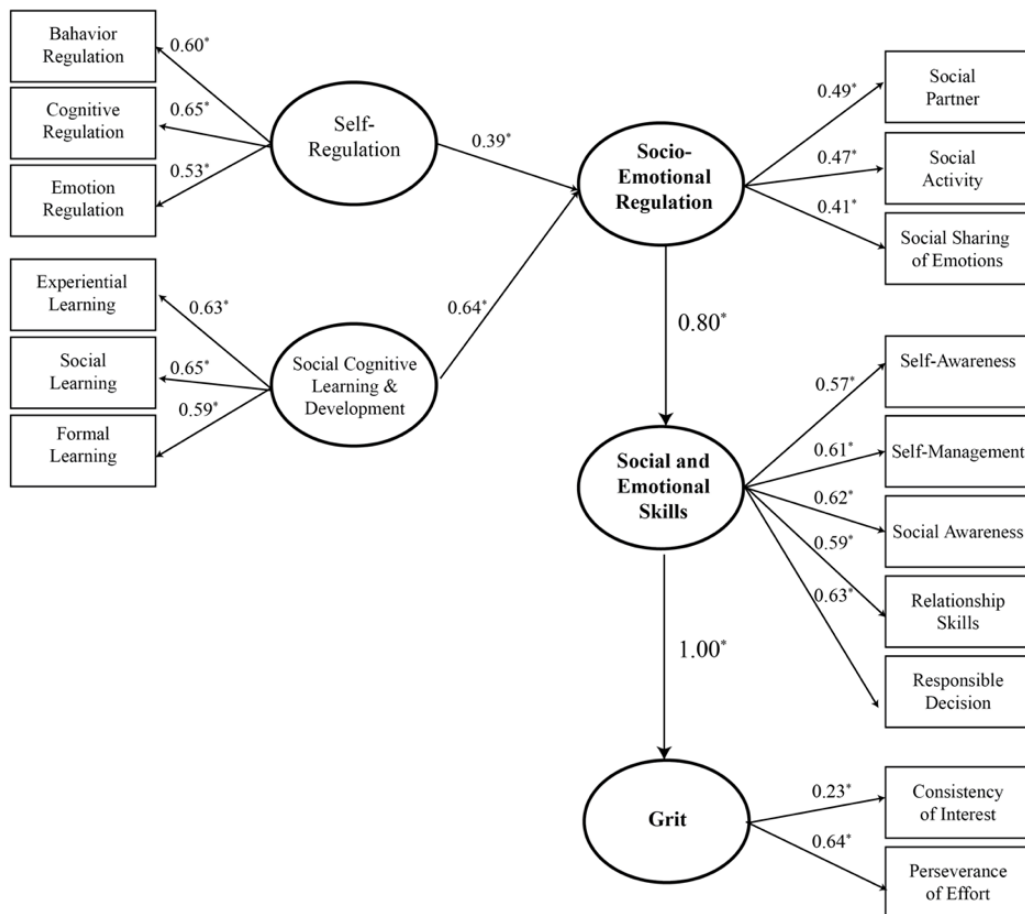


Figure 47 Structural relationship between socio-emotional regulation, social and emotional skills (SEL), and grit

Table 20 Goodness of fit indices for the structural equation model

χ^2	df	RMSEA	CFI	TLI
71.686*	62	0.021	0.999	0.998

χ^2 = Chi-Square statistic; df = degrees of freedom; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; * $p < .05$

Secondly, the results of Structural Equation Modeling (SEM) have found that the model fits the empirical data. The model's overall goodness-of-fit is statistically significant, indicating that it meets the model-fit criteria and provides an acceptable fit interpretation. All values are considered acceptable, the chi-square goodness-of-fit indices ($\chi^2 = 71.686$, $p = .187$, $\chi^2/df = 1.156$, root mean square error of approximation (RMSEA) = .021, comparative fit index (CFI) = .999, Tucker-Lewis index (TLI) = 0.998. In summary, the fit of the hypothesized model was acceptable (see Fig 2 and Table 3). Further path analysis revealed the significant, positive, and direct effect from SR to SER ($\beta = .392$, $p < .05$), SCL to SER ($\beta = .635$, $p < .001$). Moreover, SER was directly and positively associated with SES ($\beta = .801$, $p < .001$), and SES was directly and positively associated with GRT ($\beta = 1.000$, $p < .001$). All the hypotheses were supported and accepted [Table 21].

Table 21 Estimate and p-value for the structural model

Effect	Estimate	SE	S	P
SR -> SER	0.392	.128	0	3 < .05
SCL-> SER	0.635	.129	0	4 < .001

SER-> SES	0.	0	1	< .001
	801	.068	1.836**	
SES ->GRT	1.	0	7	< .001
	000	.126	.890**	

4.2 The result of an investigation of how socio-emotional regulation impacts grit based on the instructional technology via online social collaborative note-taking in the web (Phase 2)

In this study, a design research approach in educational technology (Reeves, 2006) was used to analyze problems and develop solutions in 4 stages; initial, alpha, beta, and gamma. We started with a semi-structured interview method with 5 experts and 11 graduate students in the initial stage to discuss, empathize, analyze, and develop a shared understanding of the problem. The experimental digital learning platform, a web 5.0-based digital learning tool, was developed in the cycle of testing and refinement during the Alpha and Beta stages. Lastly, during the Gamma phase, the final product was refined, and findings were analyzed to produce educational technology design principles and recommendations (guidelines) to enhance solution implementation of workforce skills of the future in higher education. Table 21 reveals the design research procedure of the current study. The sub-cycles within the project are adapted from (McKenney & Reeves, 2019). This study emphasized the following research questions, which were developed to guide the study:

What are the practical problems related to the workforce skills of the future that lead to grit via the design and technology?

What are the components and procedures of the learning & development (L&D) model through the web 5.0 concept to develop future workforce skills in social-emotional skills and grit?

What implications do the results have for the refinement of workforce skills of the future that impact graduate students learning?

Table 22 The summary of the design research procedure

Initial	First	Alpha	Revisited	Second	Beta	Third	Gamma
Analysis and Exploration	Design and Construction	Evaluation and Reflection	Analysis and Exploration	Design and Construction	Evaluation and Reflection	Design and Construction	Evaluation and Reflection
Stage 1		Stage 2		Stage 3		Stage 4	
Sub-Cycle	Multiple Sub-Cycle		Multiple Sub-Cycle		Multiple Sub-Cycle		
	Prototype I		Prototype II				
Document Analysis Empathize Interviews	Preliminary design	Usability Observations Interview		Mockup	Usability Testing Form	Final product	User Satisfaction Survey

In this study, 5 experts and 11 graduate students in Thailand were recruited using purposive selection based on the following criteria. Firstly, 5 experts were invited to participate in analyzing the practical problems and reflecting on producing design principles. The experts were: two experts in the field of educational technology and communications or instructional web designer, computer science,

two experts in the field of social psychology, and one expert in educational research, and educational measurement and evaluation. All qualified experts have at least 2 years of experience in the field and have strong academic work or have been recognized in those disciplines. As a result of the invitation, we had three experts from Thailand, and two from the United State. Then, 11 graduate students were voluntarily recruited for semi-structured empathize interviews, and the design and construction activity used purposive selection. The graduate student participants were currently studying a master or doctoral program (several years of study) at the Faculty of Education, Chulalongkorn University, Thailand [Table 23].

Table 23 Demographic of graduate student participants.

		N	
		(11)	%
Gender	Male	4	36.4
	Female	7	63.6
Age range	23-28	2	18.2
	29-33	7	63.6
	34-40	1	9.1
	46-50	1	9.1
Level of study	Master degree	7	63.6
	Doctoral degree	4	36.4
Year of study	1	1	9.1
	2	4	36.4
	3	4	36.4
	4	2	18.2
Devices	Laptop	5	45.5
	Desktop Computer	2	18.2
	Tablet	2	18.2

		N	
		(11)	%
	Smartphone	2	18.2
Web Browser	Google Chrome	8	72.7
	Safari	2	18.2
	Etc.	1	9.1

4.2.1 The analysis of the practical problems related to socio-emotional regulation and grit via online social collaborative note-taking in the web 5.0.

With the approval of the research ethics review committee for research involving human subjects, we appointed the experts and graduate students who voluntarily participated in the study via zoom meeting. With the inform of consent, the experts were asked for a one-time semi-structured interview. Graduate students (users) participated in several activities, including the empathy interview, usability observed activity, and the tryout of the final product. The researcher took the role as a test observer, data gatherer/note-taker, and timekeeper. As for the data analysis, all of the interviews were transcribed and the names of the interviewees were removed to avoid bias in the coding. Then, based on our Structural relationship between socio-emotional regulation, social and emotional skills (SEL), and grit, we created an initial set of codes for NVivo software for qualitative data analysis. The descriptive statistics, mean, and standard deviation were used for quantitative.

Initial Stage

Table 24 The defined case classifications extracted from the initial empathy interview

Name	Files	Reference Counts
Self-and Socio-Emotional Regulation	3	5
Self-Regulation	5	7
Socio-Emotional Regulation	11	32
Design and Technology	1	1
Digital Learning	11	26
Digital Tools	13	44
Workforce Skills of the Future	12	22
Graduate Student	13	22
Grit	14	21
Social and Emotional Learning (SEL)	14	25
SEL+Grit	5	18

Firstly, the disclosure of early empathy interview analysis with five experts and eleven graduate students based on relevant literature assisted us in shaping the concepts of prospective design and construction [Table 23]. It has been observed that a fundamental development of graduate programs is targeted at producing leaders rather than followers. As a result, graduate students may encounter physical,

emotional, or mental issues as a result of their studies. In this scenario, the ultimate purpose of education was students' physical well-being, psychological well-being, and social-emotional competence development.

The experts and the target group of recent graduate students discussed future workforce skills. The tired's concern has been directed into real-world studies. In the near future, we potentially involve other individuals from various parts of the world, some of whom you may have never met before. This will increase the urge to socialize toward a more innovative, creative, and collaborative work environment. There are requirements for hard skills and a greater emphasis on soft skills. For instance, some experts explained that:

“Now looking at COVID-19 people getting more physically, geographically, isolated, physically isolated. They’re getting online now. Why are they getting online to, to talk with each other?” and “Where humanity and, in the future, work will take the form of collaborations. So, you’re not just working by yourself anymore, but working with others now. How would you deal with it?”

According to graduate students' perspectives, they emphasized developing of both hard and soft skills, including decision-making, L2 (second language) proficiency, technological ability, information literacy, and digital literacy. Additionally, the concern falls under psychological well-being during career development, with adequate socio-emotional regulation that is beneficial while interacting and dealing with others. They concluded that in the future, standing still will make them slower. It has been remarked on the fact that graduate students must understand how to seek knowledge in an ever-changing environment. Graduate students summarized the following:

“Work in the future will undoubtedly change. Therefore, the social and emotional skills that we have to direct ourselves is essential, especially during COVID-19, when we work from home through more technological tools” and also viewed as “This is a great opportunity for us to develop their social and emotional regulation capabilities. I think this is important. Next, we have to go to work with technology. Socially and emotionally, there will be a lot of technology. Technology is just a tool, which is an important aspect of future teaching and learning. However, in its best way, nothing teaches human, social and emotional, perseverance.”

As a result, this study focused on the link between the potential future workforce skills and some of the ideas for designing digital tools to support the desire to learn.

Grit

Perseverance derived from self-efficacy is something that graduate students learn over time. The passion that encourages learning must begin with a skill that is repeated over and over again. The expert stated that perseverance variables are human variables, meaning whether past, present, or future, these are still important roles. Some of the experts explained that:

“I would say that a nurse, for example, a triathlete is a person who participates in triathlons, or a nurse requires grit in order to save a patient. This type of personal attribute must be nurtured or developed in a specific situation.” They also stated, “Passion arises from the social conditions that are our thoughts. Therefore, grit is probably a cross between an attitude, passion, and a buildable skill. People who are graduating from bachelor's and doctorate degrees set goals and develop themselves to that point.”

Grit is considered more of an individual than a social learning activity; however, there are some inferences to the social skills. Experts stated that perseverance requires concentration and emotional determination in which a person has an inference to society. Same as the perspectives of graduate students, who have complete maturity and are completely qualified, graduated with a bachelor's degree, a graduate aged 22-23 years or more. As a result, their socio-emotional skills will be in good shape. It would imply that certain people from various socioeconomic backgrounds and cultures could learn to contribute to social and emotional learning, which will be necessary for the future.

Social and emotional learning (SEL)

Within the empathy interviews, graduate student participants expressed the need for social and emotional learning during the study and for the future of the workforces:

"It's a big challenge because pursuing a master's degree entails great stress and pressure." To ensure a smooth working environment until success, the work group's relationship and communications must be strong and not too stressful."

"People today face an array of different issues. Because of a lack of social and emotional skills, people are unable to control their emotions. These are serious issues." "Children come to work with us when we are adults and have a new generation. It will function through sharing; therefore, social skills will be critical to our survival and must be fine-tuned in social matters across generations." "We are going to connect with those around us in the society. As a result, we have to understand our emotions, control our emotions, and adjust our emotions. Like in the current situation, people start working remotely, we need to communicate and collaborate with others."

The experts have drawn a big picture of social and emotional learning. There is a latent course in any curriculum that plugs the idea of a goal in life with a helper

for students to identify their goals in life faster and have better social skills, which self-regulation affects socially.

"It always plays an important role in the past and current and the present and the future; when talking about social learning, we usually talk about how people combine their cognitions to solve the problem. when you are working with another human being, since all the human being emotional, then social emotional learning is important." They proposed the blended of collaborative learning: "We have emotions and the intersection with collaboration, with another human being we are involved in the social and emotional aspects of that. There are many social media inferences, and social emotions from people, so I think it would be more helpful."

Self- and socio-emotional regulation

Self-regulation is essential to developing social and emotional strategies because sometimes we know we are on a team, but we do not direct ourselves to fulfill our role in the team to the fullest. Therefore, it is thought to be related skills. The expert pointed this issue to the cognitive constructivism and social constructivism theory. They also reflected the opportunity to develop these skills together. The possible explanations for these are as follows;

"If self-directed, that leads to grit, such as being disciplined, responsible, discipline leads him to his goal to success." "Being a self-regulated learner, a self-starter tied into the social-emotional learning, because to me that is defined as mature. What, if you have someone in a team and the team refuses to do their part, how do you sit down and talk to that purple person and urge them to get more involved?" "We did focus enough on that part for the current situation. Like here, we now facing the

COVID-19. Do you see any stench of opportunity for developments of socio-emotional regulation?”

Learning design and technology

In this part, we examine the technique of learning to help better design and construction. First and foremost, goals must be set or a timetable must be established. As a self-starter, preparing yourself, being open-minded, and sharing an emotional experience as an emotional empathy are crucial factors. The expert discussed the following issues:

“I seek to create a fun environment so that everyone is ready to work and that we can all communicate before we start working. It’s not a style that must be stressful to accomplish, but it requires you to strike a balance between work and mood.” “You must listen to others, open your heart, and see that we are diverse. There must be various ideas, so they must be carefully considered.” “The best way to modify your mood is to start with yourself. Preparation is essential. Consider that not everyone is always prepared, and you may get into difficulty or be upset. For others, we may be talking about the same idea, but with different words and a different tone.”

Besides, social learning is highlighted to help others learn and work together in an appropriate learning environment. Principles for promoting social emotion must be a group process. For example, taking advantage of the group process, e.g., cooperative, collaborative learning through success cases, virtual simulation, and a learning community that tries to get everyone involved. Additionally, social emotions must be cultivated.

“We live in a learning society, with many people’s mental states in societal ecosystems that can grow these skills in a secure atmosphere. Simulations of how you might react in a given situation, emotional thinking

about it, and actual experimentation in a safe environment are needed," and one of the experts stated that "It is obvious that emotion in this context refers to the relationship between the members of the workgroup. There is an open mind to accept each other, which is an open mind to collaborate. The task will be completed more efficiently."

Graduate students proposed the following ideas of being mindful and sharing emotion to adjust group emotion with several techniques, e.g., taking time to adjust moods, using media and mindful activities, and taking responsibility for the community of learning:

"Enabling techniques include goal setting and working together to achieve goals. Everyone will work together to achieve the same goal. Our work is sometimes too goal-oriented, resulting in an unsatisfactory mood." and "I think a community of learning is critical for this. The idea that you take responsibility for your own learning path is critical; students who do well in a doctoral program or do well in online learning are taking responsibility for their own learning."

Graduate students offer some strategies: *"I will wait for him to recover from that stressed time, just let him calm down and adjust his mood. When he seems to get better, then ask him if it's okay and then come back to talk about work the next day."* and *"Practicing positive thinking for a long time likes to read books, listen to music, watch series which helps a lot to give you peace of mindfulness."*

Digital tools

The experts shared their thoughts on certain learning tools, such as a vision board that represents goals and some social condition stimulations (creating a social story by adding conditions) to practice decision making. Self-reflection is another technique, as is maintaining a journal of how you're changing and growing because

part of social and emotional growth is simply awareness. Tools such as a note-taking system and a journal accommodate varied learning styles and preferences. Furthermore, graduate students requested digital tools that improve two-way communication, such as collaborative writing tools. In the conclusion, they were talking about mood-lifting tools, such as tools related to meditation, inhale, exhale. Colors, drawings, and emoji fills can be used to change the mood of others. It is beneficial to change the tone of your writing. Handwriting, mind mapping, and creating drawings to describe my emotions are some examples of activities. Here are some of the comments posted by the experts that emphasized the rise of the online platform:

"I think with so much of content being forced online and interaction being forced online, I think those learners with a high level of social emotional regulation will succeed." "The web is one of the best platforms where people can interact, obtain information from each other, interact with each other, and even produce something together through the platform."

Experts mentioned that in the future, sensory grit could be our sensitive arrangement. Perhaps it's a strategy to encourage more emotional cognition. It detects our movements. This could soon be the one that can measure our emotional movements and accelerate the development of social emotional skills in a safe atmosphere. Also, tools have become more complex; for example, it is now possible to design a tool to remind or give consciousness to them using sketching and writing. The learner can participate in writing, and through this writing, we connect with one another, we talk, and we share. So, with all of these activities, we're fostering social and emotional regulation, as well as writing. However, the experts posted some concerns:

"I also argue that teaching social behavior regulation is dangerous using web 5.0 because it is a technology you can modify or decorate in any

way. Talk to unknown people on a board that is unreal. When they meet in real life, they don't match. No matter what, we want to see faces, meet face to face, to see the personality and the way of thinking.”

The benefit of the entire graduate students and experts agreed that in the future of workforce education, a focus on psychological well-being during professional development would be important, as will the ability of students to regulate their socio-emotional learning in real-world contexts. From the empathy interview, some of the key messages from the qualitative findings, what this study added to our knowledge were:

- A socialized work environment that is more innovative, creative, and collaborative
- Perseverance demands attention and social-emotional determination in which a person has an impact on society
- Socio-emotional control tools that interact, share, and deal with others to get everyone involved

4.2.2 The online social collaborative note-taking in web 5.0's rapid prototype.

4.2.2.1 Alpha stage: prototype I

The key results from the initial stage's key results helped us create the first design of the experimental platform [Fig. 48]. Based upon the relevant literature and early empathy interview that serve the future of the workforce's learning. We employed the concept of a group process, the empathy board, which allows users to type, draw, and send emoticons, and the reflection of user emotion, which can be visualized individually and as a group and is classified by day, week, and month. Then, we brought the preliminary mock-up to the users (11 graduate students) for the usability observations interview. According to the interview activities, we have

gained some insights into overall feedback, highlights and important benefits, functions that might be useful, weaknesses/ negative effects, some misunderstanding, ambiguous or confusion, the possibility of practical application, and additional suggestions.

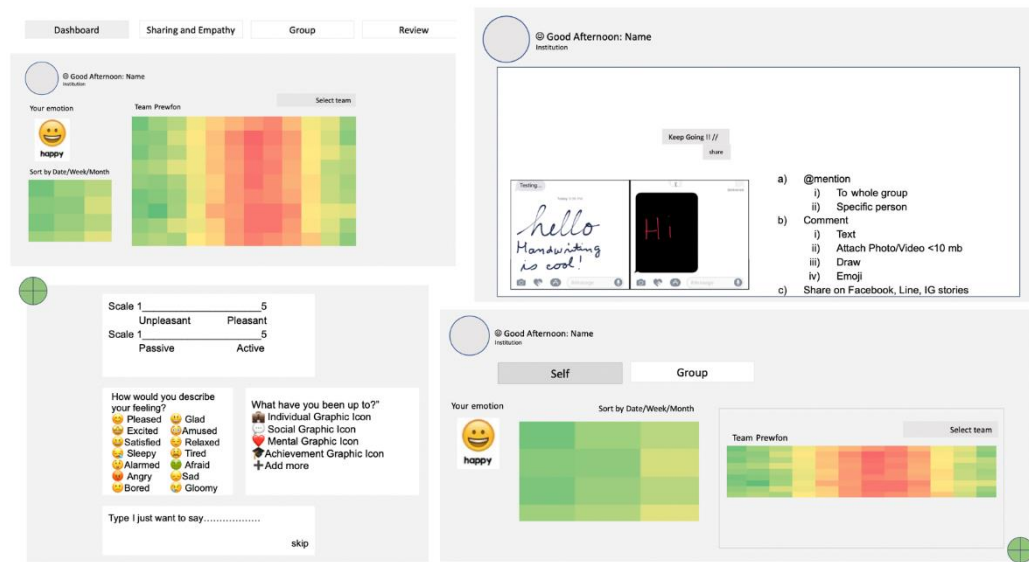


Figure 48 The preliminary idea of the platform from the initial empathy interview.

According to the observations of the usability interview, graduate students feel it is a tool that allows them to investigate themselves, particularly emotionally at work, which may affect the effectiveness of their work. It will be an app that keeps track of their moods for each day, week, and month, allowing us to look at our overall mood. The first design appeared to be simple and straightforward to use. Several keywords can explain the preliminary idea: good mind, explore yourself consciously, promote others with awareness, and review the mood. Furthermore, participants highlighted the benefit of recording emotions during each task that may help us look at historical data analytics. The platform can be a place that helps to encourage each other to work with people in the team. Some useful functions were reflecting emotions during one's work, reviewing the team's emotions, connecting to different teams with the source of individual's data, and sharing empathy tools. Some

of the weaknesses may be that sometimes the emotions we record may derive from the emotions that arise from the job but rather other stories. Emotion may be recorded with feelings that are not true. Sometimes in the recording, we see that we have too many negative emotions. It may be discouraging to keep working. Some participants were concerned about the frequency of emotional reflection if one of the team members forgot to enter the routine. They asked questions like, "How would it assess the results?", "How will the Heat map team emotion table be visualized?", and "Will there be enough channels if it's monthly?" The participants also asked for the step-by-step video manual at this stage. Additionally, they felt that it is possible to make it because the appearance of the tool is not complicated to use; however, they were not confident in routine or people may forget to record. It might look like a challenge that encourages people to use it every day, which require more automation, likes notifications via chatbot.

4.2.2.2 Beta stage: prototype II

We have revisited all the comments and suggestions to develop the mockup [Fig. 49]. The one-page web application was selected to be the main theme. The design of emotions and colors was launched. The web application "Sociemo" (social + emotional) was developed with Java Spring Boot and MariaDB (Fig. 4). The project used the following code to visualize self-and group emotion. The java code generates a summing average of a person, and team emotion visualization with the statistic mean $\sum X(n)/n$ and displays with HeatmapPoint.

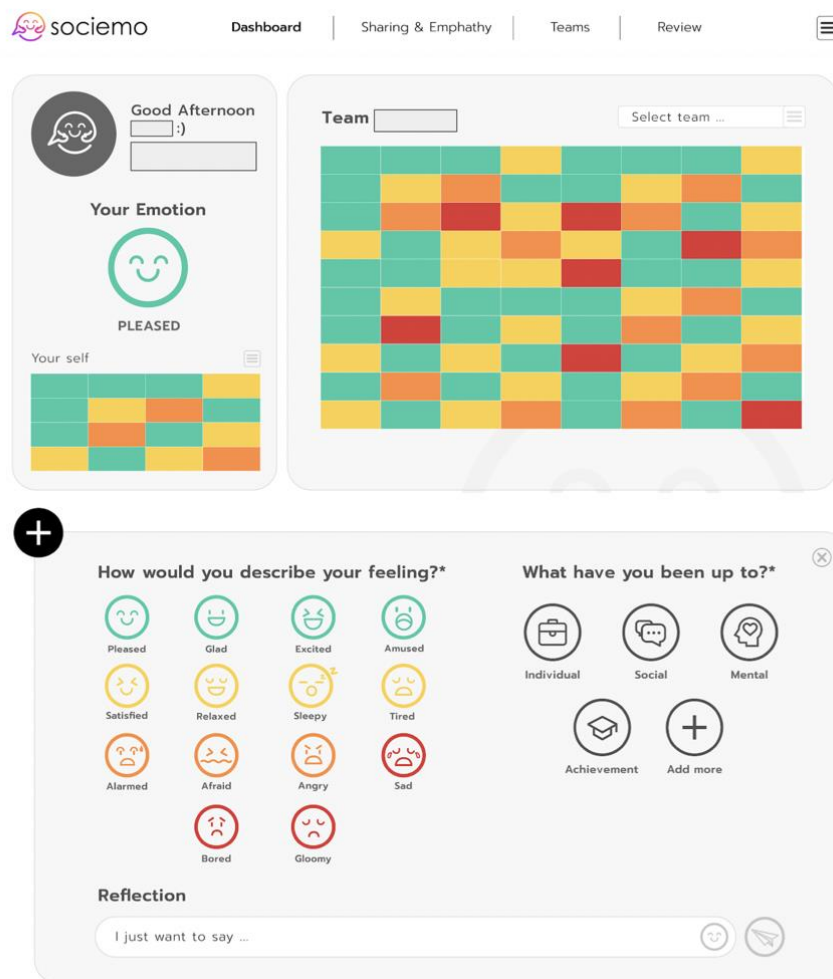


Figure 49 “Sociemo” Mock up platform.

In addition, users were encouraged to complete tasks during usability testing to assess their performance. The effectiveness (task accomplished) and efficiency (average task attempted time) were evaluated by the users. Researchers conducted observation techniques with observed time presented in Table 4. The findings showed that the average time on task was between 0.19-1.24 mins. View members’ emotion dashboard received the lowest average time on task completion.

This research also use the visual iconography of emotion applied to Graphical User Interface (GUI) design. The SOCIEMO platform, presented as a website, is being developed and has six primary features and functions: dashboard, profile setting, team members section, interactive review component, sharing & empathy section,

and an emotion reflection tool. The research design took into account the social sharing of emotions theory, which is defined as a way to share emotional experiences with others to regulate emotions at both individual, interpersonal, and collective levels. A set of 14 emoticons that represent Lang's 2-dimensional affective space model (Bradley & Lang, 1994) distinguished by valence (unpleasant, pleasant) and arousal (passive, active) is being used for emotion recognition, together with additional visual elements (shape and colors).

Table 25 Task performance during the usability testing

Tasks N (%)	Failed	Accomplished (Some difficulties)	Accomplished (Minor difficulties)	Accomplished (Without difficulties)	Average time on task (Mins)
Create new account		1 (9.1)	2 (18.2)	8 (72.7)	1.24
Create group		2 (18.2)	3 (27.3)	6 (54.5)	0.37
Add members		3 (27.3)	4 (36.4)	4 (36.4)	1.11
Share self- emotion		3 (27.3)	2 (18.2)	6 (54.5)	1.16
View self- emotion dashboard		1 (9.1)	3 (27.3)	7 (63.6)	0.22
View a whole group's emotion dashboard		1 (9.1)	4 (36.4)	6 (54.5)	0.21

Tasks N (%)	Failed	Accomplished (Some difficulties)	Accomplished (Minor difficulties)	Accomplished (Without difficulties)	Average time on task (Mins)
View member's emotion dashboard		1 (9.1)	5 (45.5)	5 (45.5)	0.19
Send a message to members	1 (9.1)	1 (9.1)	1 (9.1)	8 (72.7)	0.23

An attempted time when task not completed successfully (some difficulties 3- 5 times, minor difficulties <3 times)

Mostly encountered problems were adding members and the visualization board. We have found some diagnostic usability problems, e.g., the interface, terminology, and work (Walji et al., 2013). According to the interface, it seemed not to fit the screen (responsive issue). For terminology, there was time-consuming to enter a diagnosis and inconsistent naming and placement of the user interface, such as the word “position” on the register page. When adding members, users are unaware that they must hit enter rather than the button; they create the group, but it does not start, and they are unable to send messages to group members. The system is constantly forcing users to refresh frequently. In this case, the most frequent token error message was “Cannot load team data java.lang.Exception: Invalid Token!”. Users also found inconsistent naming and placement of user interface widgets such as “draw icon” being used for sending a message, selecting “team” before sending an empathy message and difficulties viewing individual's emotions in each team. Here are some suggestions and additional comments on the prototype. Besides, users proposed the decision support such as tooltips and navigation guidelines, for example, 'Check Your Team Feeling Here', 'Chat with your

team here’. Secondly, they asked to adjust the menu button to be clearer using the color and add icons to convey meaning and make the layout easier to understand, e.g., the separation of self-and group emotion visualization.

4.2.2.3 The prototype: Gamma stage: final product

After the evaluation and reflection, the final product of the “Sociemo”, a social sharing of emotion platform, was developed. The web application was brought back to the users to produce design principles and enhance solution implementation. The “Sociemo” web application (Fig. 5) has six primary features and functions: dashboard, profile setting, team members section, interactive review component, sharing & empathy section, and an emotion reflection tool. According to the user’s satisfaction survey [presented in Table 25], usefulness and satisfaction received the highest mean at 4.00 (which mean above 3.50 reflected the high level). The overall mean satisfaction was at 3.89.

Table 26 The overall users’ satisfaction

Indicators	Mean	SD
Usefulness	4.0000	.53666
Efficiency	3.8545	.28413
Effectiveness	3.8312	.67557
Learnability	3.8182	.50114
Satisfaction	4.0000	.66144
Accessibility	3.8409	.46466
Overall	3.8908	.42628

Additionally, users were asked to rate the semantic differentials to describe the product by selecting a favor one of two adjective pairs [Fig. 50]. This finding confirmed that the platform is considered modern and interesting. It's important, though, that future developments focus on how easy it is to utilize the interface. As the last step, we must think about how to maintain the platform functioning for the future and keep users engaged.

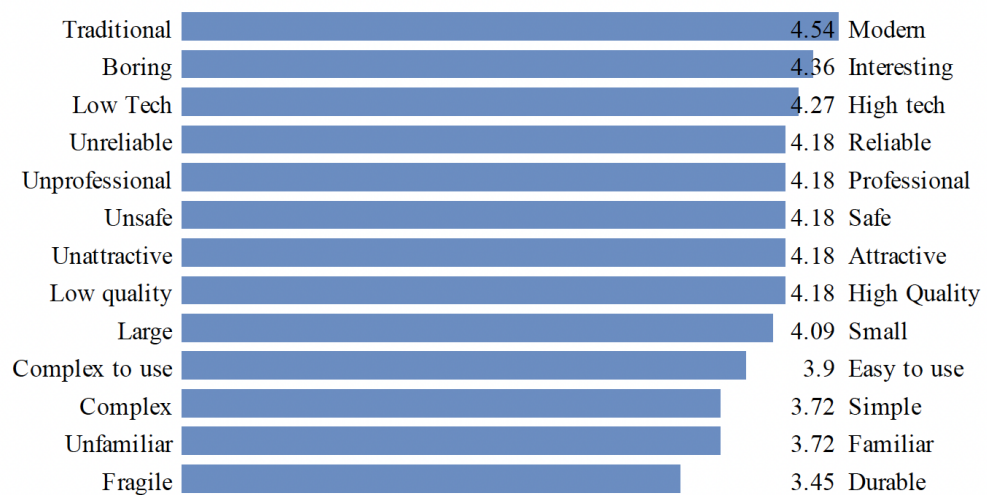


Figure 50 The semantic product differentials rating.

4.2.3 The effects of online social collaborative note-taking via web 5.0 on social and emotional skills and grit.

We conducted the online learning and development group activity from September 20- December 10, 2021 using 5 hrs./week Total 60 hrs. with the following objectives:

1. Explain the importance of research (covering research problems and rationale)
2. Define research questions, objectives, definitions, conceptual frameworks, research scope, and expected outcomes
3. Review the theory and research involved in the literature review
4. Design research methodology and action plans
5. Make references in the correct format

6. Write and prepare thesis proposal presentation

The required learning materials were:

1. Social-Emotional collaboration platform “Sociemo”
2. Collaborative note-taking platform “Google Docs”

Within the study, participants were asked to complete several activities, including:

1. Self-regulation in compliance with the tasks set to be achieved within the academic year 2021
2. Set the group's shared goals according to the “Socially-Shared Regulation” guidelines. Brainstorm ideas to determine the workload to be completed within the academic year 2021, according to their own goals, and formulate strategies and methods of online communication based on group learning and development principles under the 70:20:10 approach.
3. Work closely with the group members (by the advisor) using socio-emotional regulation strategies.

Table 27 Evaluations of the learning and development activity

Types of assessment	Date	Assessor
1. Self-Report on Social and Emotional Self-Regulation of Higher Education Students	1st time: before the activity 2nd time: Week 6 (31 October) 3rd time: After the activity (3 December)	self-assessment

	Types of assessment	Date	Assessor
2.	Self-reflection and evaluation on individual and group work	Session 1: Week 3 (October 10) Session 2: Week 6 (31 October)	reflection and self-assessment
3.	Group reflection and evaluation	Session 3: Week 9 (November 21)	group members
4.	Thesis proposal self-evaluation	After the activity (10 December)	self-assessment

After 12 weeks of the experiment, we examined the mean and standard deviation of the social and emotional skills and grit. Furthermore, a repeated-measures ANOVA was performed to compare the effect of the 70:20:10 learning and development model on social and emotional skills and grit. It has been found that the mean of social and emotional skills and grit were increasing accordingly. First and foremost, the mean score of social and emotional skills from the pre-activity (beginning), during the activity (6 weeks), and post-activity (12 weeks) were ($M=3.29$, 3.85 , 4.20 , $SD=.31$, $.51$, $.27$). The following mean score of grit were ($M=2.80$, 3.46 , 3.56 , $SD=.305$, $.531$, $.472$) respectively.

Table 28 The descriptive statistics of mean and standard deviation

	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>
SEL-pre	14	3.2905	.31769
SEL-during	14	3.8524	.51052
SEL-post	14	4.2048	.27731
GRIT-pre	14	2.8036	.30506

	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>
GRIT-during	14	3.4643	.53130
GRIT-post	14	3.5625	.47218

Second, for the condition by the timing of social and emotional skills self-report, sphericity was met as indicated by Mauchly's test (reject the null hypothesis if $p < 0.05$), $\chi^2(2) = 1.293$, $p = 0.524$. We have found a statistically significant difference in social and emotional skills between at least two periods of time ($F(1, 2) = 4190.43$, $p < .05$).

Table 29 The results of the repeated measures ANOVA of Social and emotional skills

Source of variation	SS	df	MS	F	P-value
Between Groups	600.919	1	600.919	4190.439	.000
Within Group	5.954	2	2.977	20.179	.000

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The subsequent post-hoc analyses compare the difference between each pair of means to a critical value. It has been found that tests of the hypotheses were conducted using Bonferroni adjusted alpha levels of .0125 per test ($.05/4$). The pairwise comparison of the middle and post activity was non-significant. The average mean scores of the middle and post-activities combined ($M = 3.85$, 4.02 , $SD = .51$, $.27$) was significantly higher than those at the beginning of experiment ($M = 3.29$, $SD = 3.31$), ($p = .008$, $.000$).

Table 30 The post hoc comparisons of social and emotional skills using Bonferroni correction.

(J) factor1	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
				Lower Bound	Upper Bound
pre-middle	-.562*	.152	.008	-.978	-.146
Pre-post	-.914*	.121	.000	-1.245	-.583
Middle-post	-.352	.160	.140	-.793	.088

Third, for the condition by the timing of the grit scale, sphericity was met as indicated by Mauchly's test (reject the null hypothesis if $p < 0.05$), $\chi^2(2) = .774$, $p = 0.679$. We have found a statistically significant difference in grit between at least two periods of times ($F(1, 2) = 2451.176$, $p < .05$).

Table 31 The results of the repeated measures ANOVA of grit

Source of variation	SS	df	MS	F	P-value
Between Groups	450.968	1	450.968	2451.176	.000
Within Group	4.770	2	2.385	11.513	.000

The next post-hoc analyses compare the difference between each pair of means, then compare that to a critical value. It has been found that hypotheses were tested using Bonferroni adjusted alpha levels of .0125 per test ($.05/4$). The pairwise

comparison of the middle and post-activity was also non-significant. The average mean scores of the middle and post activity combined ($M = 3.46, 3.56, SD = .53, .47$) was significantly higher than those at the beginning of experiment ($M = 2.80, SD = .30$), ($p = .012, .002$).

Table 32 The results of the post hoc comparisons of grit using Bonferroni correction

(J) factor1	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
				Lower Bound	Upper Bound
pre-middle	-.661*	.189	.012	-1.179	-.142
Pre-post	-.759*	.174	.002	-1.237	-.281
Middle-post	-.098	.151	1.000	-.513	.317

Taken together, these results suggest that timing does have an effect on social and emotional skills as well as grit for words. The social and emotional skills and grit increased significantly after the experiment. However, it should be noted that the skills may not appear to significantly increase after the middle of activity time. The solution of practice and production design principles to enhance solution implementation will be discussed in the summary, discussion, and recommendations chapter.

Furthermore, based on the collaborative note-taking task, we examined the percentage of succession rate via the participants check-list. It has been found that, mostly participants went well with the plan, individual plan with 73%, group plan with 80%. However, the effective of group toward goal were low with the number not going with the plan 40%.

Table 33 The summarize of succession rate (Individual, Group, Effectiveness toward goals)

	Does not go with the plan N (%)	Mostly well with the plan N (%)	Go well with the plan N (%)
Succession rate (Individual)	3 (21.4)	10 (71.4)	1 (7.1)
Succession rate (Group)	1 (7.1)	11 (78.6)	2 (14.3)
Effective of group working toward goals	5 (35.7)	5 (35.7)	4 (28.6)

Next, the group participation and engagement were examined with the check-list items. It has been found that participants engaged in group properly, however there were further findings were presented via the qualitative data of reflection.

Table 34 Group participation and engagement check-list

N=15	Yes N (%)	No N (%)
1. We support the idea of a group.	14 (100)	-
2. We listen to others.	14 (100)	-
3. We Ask Questions,	14 (100)	-
4. We encourage others,	14 (100)	-

N=15	Yes N (%)	No N (%)
5. We politely disagree.	14 (100)	-
6. We are in the process of working as planned.,	13 (92.9)	1 (7.1)
. We summarize members' thoughts,	13 (92.9)	1 (7.1)
8. We expand the concept of members,	13 (92.9)	1 (7.1)
9. We summarize group ideas,	13 (92.9)	1 (7.1)
10. We reflect on progress in group work.	14 (100)	-
11. We encourage new ideas,	14 (100)	-

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According to the reflection, overall participants reflected the helping of each other and the consulting with advisors through the group process using collaborative planning. Some participants stated that:

“Collaborative planning Talking and exchanging knowledge and feelings between each other, solving problems together.” Also acknowledging the progress of group members primarily.” “Exchanged ways to learn how to think working procedures for each member of the group to apply to themselves.”

Also, group process helped them to solve problem. As some participants stated that:

“Gradually follow up, give advice, listen to ideas and problems.”

“Working together can make work progress. and when encountering problems help each other solve problems.” And “Learn to overcome obstacles together with a variety of problem-solving methods, flexibility and adaptability.”

However, there are some issues to consider according to the working group which some issues might need just a close friend or only one person to consult. Some participants stated that:

“There are some thoughts/feelings shared, but not much because sharing feelings tends to happen to one person more, for example asking for direct advice.”

There were some thoughts about the group learning which is necessary for the motivation to achieve their goals and to carry out the planned operations efficiently. Moreover, sharing empathy is a way for good listening and encourage other not to give up. Some participants stated that:

“Group learning encourages discussion and mutual assistance in work. make me feel motivated to work Having friends to help and give advice when encountering problems or obstacles” “Have sympathy and listen when encountering problems.” “Encouragement, not alone, encouragement to study.” “It feels good to have help and support within the group.”

However, there were still the questions about the group process in learning, especially with the self-directed learning like doing their own research topic. Some participants stated that:

“What is happening is not yet effective. It's more of a general discussion and change than a process or a body of knowledge. This makes me feel indifferent to learning in a group. Most importantly, doing a thesis is almost all self-learning and diligent. The group's influence is therefore minimal. If it's a project or a group project It should show participation, cooperation, sharing of ideas more because the nature of work requires participation.”

Using a thesis proposal inspection evaluation form submitted by thesis advisers, we investigated at the cognitive assessment of the thesis proposal. We used the following criteria: Under 60 percent Fail, 60 - 74 percent Passed, 75 - 84 percent Good, and 85 - 100 percent Excellent. All of the participants were found to have met the minimal requirements. Eight of the 14 participants obtained excellent grades, four received good grades, and two received passes (see Table 32).

Table 35 The results of thesis proposal examination

No.	Score	Interpretation
1.	63.33	Passed
2.	100	Excellent
3.	100	Excellent
4.	100	Excellent
5.	100	Excellent
6.	100	Excellent
7.	100	Excellent

No.	Score	Interpretation
8.	80	Good
9.	80	Good
10.	80	Good
11.	91.66	Excellent
12.	63.33	Passed
13.	90	Excellent
14.	80	Good

4.3 The result of the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0 (Phase 3).

In this section, we aimed to present design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0. Also, the learning and development with collaborative notetaking model for enhancing higher education students' workforce skills of the future in socio-emotional regulation and grit based on a web 5.0 approach is proposed.

4.3.1 The design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

This research brought the critical characteristics of design experiment by integrating known and hypothetical design principles with instructional technology to generate solutions to these complex problems. Then, we developed the prototype solution based on the design principal (T. C. Reeves, 2006). To clarify the described of theory testing, researcher adopted the four-step sequence of Edelson (2002): 1) the

development of a theory, 2) the derivation of principles for design from the theory, 3) the translation of the principles into concrete designs, and 4) the assessment of the designs to test whether they work as anticipated.

4.3.1.1 The development of a theory.

With the use of the structural model structural equation modeling (SEM), the model's effectiveness is validated with the empirical data to generate the outcomes of social and emotional skills, and grit. The emphasized theories in this case were the self-regulation, social-cognitive learning and socio-emotional regulation where all values are considered acceptable via the model testing with goodness of fit indices for the structural equation model.

Table 36 The development of a theory

Theories	Variables	Goals
(Phase 1)		
Self-regulation	<ul style="list-style-type: none"> - Behavior regulation - Cognitive regulation - Emotion regulation 	To create goals and monitor their progress and participation
Social-cognitive Learning and development	<ul style="list-style-type: none"> - Experiential Learning - Social Learning - Formal Learning 	<p>To negotiate to manage the workload</p> <p>work processes and joint strategies</p> <p>sharing group goals that align with their goals</p> <p>awareness as a part of a group and social sharing of emotions</p> <p>group assessment of group</p>

Theories	Variables	Goals
(Phase 1)		processes
Socio-emotional regulation	<ul style="list-style-type: none"> - Social partner - Social activity - Social sharing of emotions 	To set goals together in the group to create results and to contribute together resulting from the goals of each individual

4.3.1.2 The derivation of principles for design from the theory.

Researcher therefore, brought the theory to the design with instructional technology via the integral part of web 5.0 approach. In this topic, we highlighted the design principle which derived from the design. Through the design, collaborative note-taking, social activity, task management, self and group emotion reflection tool, and sharing & empathy section are used to incorporate general background theories.

Table 37 The derivation of principles for design from the theory

Variable	Web 5.0 approach	Design Principle
Social activity	<ul style="list-style-type: none"> - Collaborative note-taking - Social activity 	A socialized work environment that is more innovative, creative, and collaborative
Social partner	<ul style="list-style-type: none"> - Task management (led by group) 	Perseverance demands attention and social-emotional determination in which a person has an

Variable	Web 5.0 approach	Design Principle
		impact on society
Social sharing of emotions	<ul style="list-style-type: none"> - Self and group emotion reflection tool - Sharing & empathy section 	Socio-emotional regulation tools that interact, share, and deal with others to get everyone involved

4.3.1.3 The translation of the principles into concrete designs

In this section, the design principle turned into the concrete design by using the technology enhanced-learning function via the web 5.0 approach. With the proved from alpha stage: prototype I and beta stage: prototype II.

Table 38 The translation of the principles into concrete designs

Web 5.0 approach	Function	Activity
Self and group emotion reflection tool	<ul style="list-style-type: none"> - Emotion reflection tool 	<i>Reflect on their own emotion and observe team emotion recognition.</i>
Sharing & empathy section	<ul style="list-style-type: none"> - Sharing & empathy section 	Share your empathy to help teams achieve their goals in a digital workplace.
Task management	<ul style="list-style-type: none"> - Dashboard - Profile setting 	Set the group's shared goals according to the "Socially-Shared

Web 5.0 approach	Function	Activity
		Regulation” guidelines.
Collaborative note-taking	- Collaborative note-taking	Work closely with the group members socio-emotional regulation strategies.
Social activity	<ul style="list-style-type: none"> - Team members section - Interactive review component 	Brainstorm ideas to determine the workload to be completed within the academic year, according to their own goals, and formulate strategies and methods of online communication based on group learning and development principles under the 70:20:10 approach.

4.3.1.4 The assessment of the designs to test whether they work as anticipated

At the last section, researcher presented the assessment of the design to test whether the interventions work as anticipated. We proposed two collaborative note taking tools which serve the collaborative note-taking process and the socio-emotional functions. The platform selected were Google Docs and the developed platform called “SOCIEMO”. Moreover, we proposed the assessment of design through the use of self-report, thesis proposal self-evaluation, self and group reflection in this setting. The detailed of the long length learning and development plan and the SOCIEMO experimental platform are discussed in chapter v.

Table 39 The assessment of the design

Design principals	Tools	Assessment
Perseverance demands attention and social-emotional determination in which a person has an impact on society	Communication tools and a platform for the collaborative note-taking process "Google Docs"	Self-Report on Social and Emotional Self-Regulation of Higher Education Students
A socialized work environment that is more innovative, creative, and collaborative	Collaborative note-taking social-emotional tools "Sociemo"	Thesis proposal self-evaluation Self-reflection and evaluation on individual and group work
Socio-emotional regulation tools that interact, share, and deal with others to get everyone involved		Group reflection and evaluation

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The current design expanded the solution of practice and production design principles together with the design guidelines to enhance solution implementation.

- A socialized work environment that is more innovative, creative, and collaborative
- Perseverance demands attention and social-emotional determination in which a person has an impact on society
- Socio-emotional regulation tools that interact, share, and deal with others to get everyone involved

4.4 The proposed learning and development with collaborative notetaking model for enhancing higher education students' workforce skills of the future in socio-emotional regulation and grit based on a web 5.0 approach.

To look into the process of generalization, we study the experts' opinion on the effective of the model. The validation is performed concerning the feasibility of the innovation by educational technology and communications experts. The validation questionnaire used is arranged in relation to the eligibility criteria of the technology acceptance model, following (Holden & Karsh, 2010). The results from the expert validation data results for each aspect is given in Table 37.

Table 40 Expert validation on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

Indicators	Mean	SD
Perceived usefulness	4.84	.357
Perceived ease of use	4.80	.447
Attitude toward using	4.92	.178

Table 32 shows an average mean of 4.84, 4.80, and 4.92, respectively, indicating highly valid for all indicators. There is some feedback relating to the future development of the innovation, including:

- Making the system more automation
- The notification system ensures that user will reflect on their own emotion in a timely manner
- Consideration for expanding the target group for learners of all ages
- Consideration for assessing the attitude toward the socio-emotional regulation through collaborative note-taking tool.

Thus, the proposed model conforms to the theoretical root. The proposed learning and development with a collaborative note-taking model for enhancing higher education students' workforce skills of the future in socio-emotional regulation and grit based on a web 5.0 approach is consists of the factors of socio-emotional regulation and the components of design-based research of proofing the web 5.0 concept. The following are the factors of socio-emotional regulation that lead from the self-regulation: social partner, social activity, and social sharing of emotion. In alignment with the factors, components of the web 5.0 concept are the following: dashboard, profile setting, team members, interactive reviewer, sharing and empathy, and emotion reflection. Furthermore, we highlighted the concept of social cognitive learning and development, which 70:20:10 portion of learning and development has been added to the context of the study. There are 70% of experiential Learning activities (oral presentation, thesis seminar), 20 % of social Learning (group meeting activities between group members and advisors, social sharing of emotion), and 10% of formal online learning. The model was presented in Fig 51.



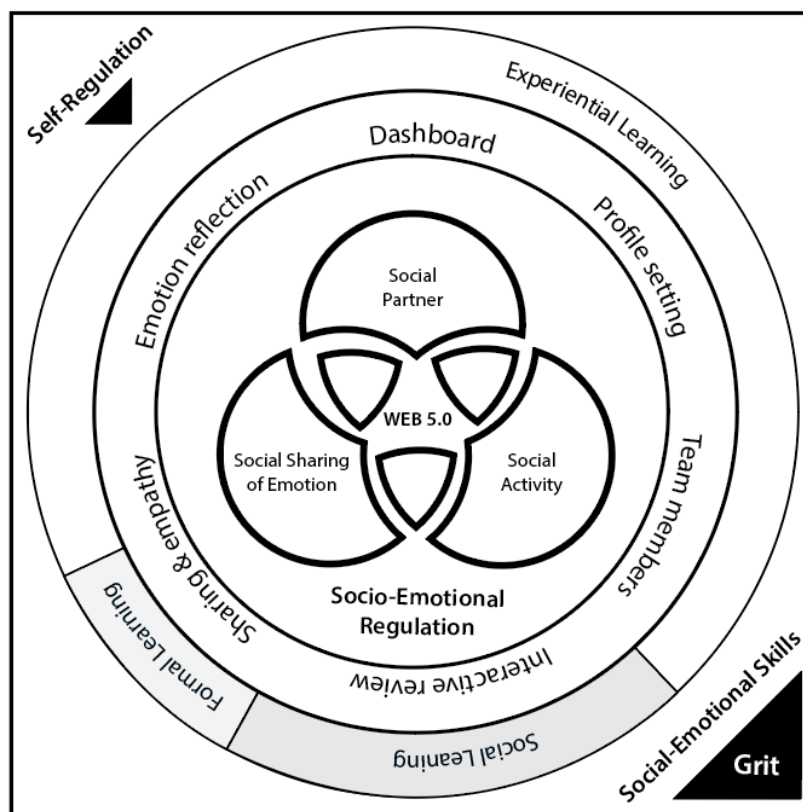


Figure 51 Learning and development with collaborative notetaking model for enhancing higher education students' workforce skills of the future in socio-emotional regulation and grit based on a web 5.0 approach

CHAPTER V

RESEARCH RESULTS

Chapter Overview

The research titled “A Learning and development with collaborative note-taking model for enhancing higher education students’ workforce skills in socio-emotional regulation and grit based on a web 5.0 approach” was conducted in the three phases. In this chapter, we highlighted the development of a learning and development activity plan, the selection of online collaborative note-taking tools, and the socio-emotional regulation collaborative platform with its manual. The research results in this chapter are as follows:

2.7 The Instructional Model

2.8 Long Length Learning and Development Plan

2.9 The SOCIEMO experimental platform

5.1 The Instructional Design Model

According to the Learning and development with collaborative notetaking model for enhancing higher education students’ workforce skills of the future in socio-emotional regulation and grit based on a web 5.0 approach presented in the chapter IV, we brought the component to generate the instructional design (ID) model for adopting or adapting the model for the future workforces.

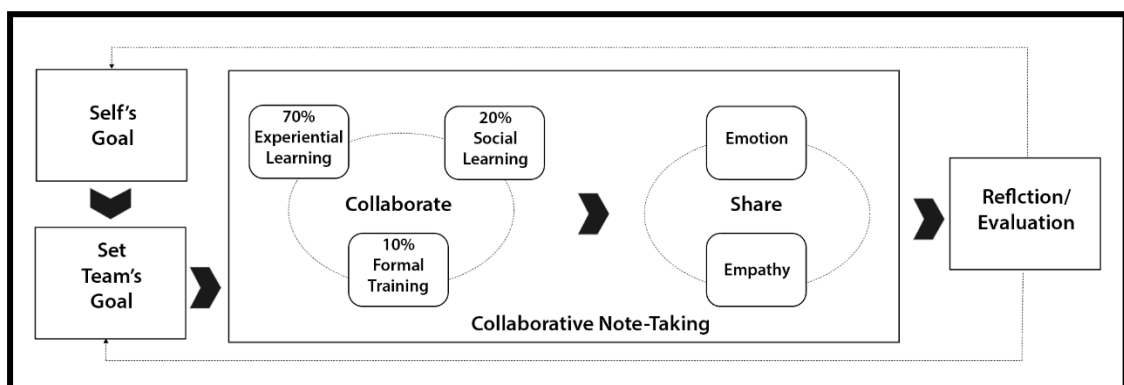


Figure 52 the instructional design (ID) model for adopting or adapting the model for the future workforce

The cycle model consists of four core elements which are;

- Have their own goal
- Set team's goal
- Collaborate
 - 70% of Experiential learning
 - 20% of Social Learning
 - 10% of Formal Training
- Share
 - Emotion
 - Empathy
- Reflection/Evaluation

The collaborative and share elements are listed under the collaborative note-taking tools. Next, we show the example of adopting the model through the experiment with the long length learning and development plan.

5.2 Long Length Learning and Development Plan (Grouped by thesis advisor)

With the learning and development goals:

- Explain the importance of research (covering research problems and rationale)
- Define research questions, objectives, definitions, conceptual frameworks, research scope, and expected outcomes
- Review the theory and research involved in the literature review
- Design research methodology and action plans
- Make references in the correct format
- Write and prepare thesis proposal presentation


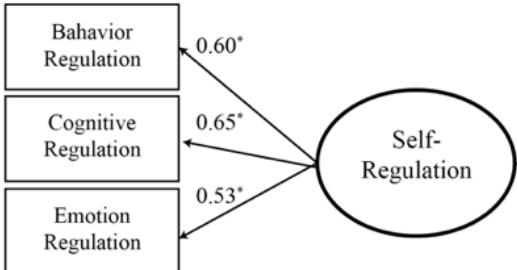
The required learning materials were:

- Collaborative note-taking platform “Google Docs” based on the selection from the ASSURE model
- Social-Emotional collaboration platform “Sociemo”

Suggestions for designing a weekly activity plan:

The plan followed the instructional design (ID) model which is extracted the factors from the structural relationship between socio-emotional regulation, social and emotional skills (SEL), and grit. The design of weekly activity plan will presented to help under stand each factor properly.

Table 41 Self-regulation and Socially-shared regulation for the context of the study revised from (Järvelä & Hadwin, 2013)

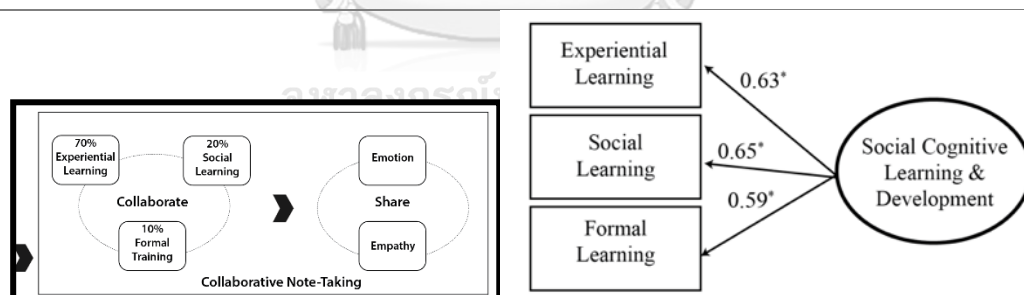
	Self-Regulation	Socially-Shared Regulation
		
Outcomes	create goals and monitor their progress and participation	set goals together in the group to create results and to contribute together resulting from the goals of each individual
Goals	make personal changes	team members negotiate and modify group control processes, strategies, beliefs, and goals.
Regulating targets	own work	negotiation to manage the workload

	Self-Regulation	Socially-Shared Regulation
-Tasks	develop own learning	work processes and joint strategies
-Cognitive	Plan for work according	sharing group goals that align with their
-Goals and plans	to their goals.	goals
	involvement in	awareness as a part of a group and
		social sharing of emotions
-Motivations and emotions	managing one's work and feelings	group assessment of group processes
-Assessment	self-assessment of goals	

In addition, in the table below, we proposed the guideline through the development of the 70:20:10 learning and development program.

Table 42 The suggestion for the 70:20:10 Learning and Development

Type of Learning	Online Synchronous	Online Asynchronous	Hrs. Recommended
------------------	--------------------	---------------------	------------------



70%	oral	• learning through case studies	42
Experiential Learning	presentation* thesis seminar*	• Synthesis of literature • conceptual framework development in • research proposal development	

Type of Learning	Online Synchronous	Online Asynchronous	Hrs. Recommended
		<ul style="list-style-type: none"> Conversations with experts 	
20 % Social Learning	<ul style="list-style-type: none"> Group meeting activities between group members Group meeting activities with advisors 	<ul style="list-style-type: none"> Sharing emotions on the system https://sociemo.app/ Expressing empathy through messages, images, or videos within the group on the system https://sociemo.app/ 	12
10% Formal Learning	<ul style="list-style-type: none"> Attending to lectures/ seminars/workshops Further self-learning 		6

For the selection of tools in this study, we used the acknowledged the uses of collaborative working tools that match the qualification of each factor following the social partner, social activity, and social sharing of emotion. Google docs is there for selected as a suitable collaborative note-taking tool. The social sharing of emotion platform needs to be developed as we presented the procedure of design research earlier in the previous chapter.

Table 43 Socio-Emotional Regulation Factors

Factors	Descriptions	Tools
<p>A path diagram with a central oval labeled 'Socio-Emotional Regulation'. Three arrows point from this oval to three rectangular boxes stacked vertically: 'Social Partner' (loading 0.49*), 'Social Activity' (loading 0.47*), and 'Social Sharing of Emotions' (loading 0.41*).</p>		
Social Partner	working closely with the group members (grouped by advisor)	communication tools “Google Docs”, “Sociemo”
Social Activity	Setting common goals for (Socially-Shared Regulation)	collaborative note-taking tool “Google Docs”
	Brainstorm ideas to determine the workload to be completed by the academic year 2021, according to their goals,	
	Formulate strategies and methods of communication online based on the 70:20:10 learning and development approach.	
Social Sharing of Emotion	Sharing one's emotions and perceiving the overall picture of the emotions of the members	Social sharing of emotion tool “Sociemo”
	Expressing empathy through text, images, or video within the group.	

Table 44 The three dimensions of self-regulation via collaborative note-taking on Web 5.0

Dimensions	Concept	Activities	Tools
Behavior	Socially-Shared Regulation	- Collaboration planning - Self/Group Reflection and Assessment	communication tools and a platform for the collaborative note-taking process “Google Docs”
Cognitive	Social Cognitive Learning and Development	-Collaborative Note-Taking	Platform for the collaborative note-taking process “Google Docs”
Emotion	Social Sharing of Emotions	- Reflection of one's group emotions - Showing empathy for others	Social-Emotional tools “Sociemo”

5.3 The SOCIEMO experimental platform

We proposed the instructions for using the Sociemo system

1. Sign up for the website <https://sociemo.app/>
 1. Processing a Membership (Register)
 2. Join the Master63 group (including Master's degree students, code 63)
 3. Group representatives create groups based on advisors. Then, invite members (Invite with Username) to the group
 4. Members agree to join the group and start sharing emotions (Social Sharing of Emotion) with the following advice.
 1. Sincerely share your emotions at that moment. By pressing the + icon and selecting or adding text as follows

1. How would you describe your feeling?* Choose your current mood/feeling.
 2. What have you been up to?* Choose the situation you are facing and result in that emotion/feeling.
 3. I just want to say... reflecting my thoughts or something to say why we have that emotion/feeling?
2. Frequency of sharing emotions
 1. At least once a day if there is no group meeting.
However, when users have not shared their emotions for a long time. The system will not take the user's data into a group visualization (Table 37).
 2. Before and after every group activity
- e. Seeing that in the overall picture of the group members are not ready to work as a group members, members should express empathy through text, images, or video within the group.

Table 45 Emotion Reflection Period (Sociemo Platform)

Online			
Synchronous	When login (timestamp)	every 15 minutes during joint activities	logout
And/or on the call			
Asynchronous	start the day (morning)	during the day (noon)	end of the day (night)

Along the stage of development, the study participants included 5 experts within the field of Educational Technology and Social Psychology (stage 1). 11 graduate students participated in the project (stages 1-4). All graduate students currently study at the Faculty of Education at Chulalongkorn University (7 master's

students and 5 doctoral students). The interview examined the importance of social-emotional regulation in order to achieve the workforce skills of the future. It also focused on designing and developing new digital tools supporting both social and emotional learning and collaboration. In the second stage, we have explored and found problems related to the user interface (UI) and user experience (UX), e.g., the navigation pane and the impact of system errors. In the third stage, after the evaluation and reflection, users provided input on the characteristic of SOCIEMO (Experimental Digital Learning Platform) with the following words: effective work (n=8), unique, useful, and modern (n=7). In this stage, we found the problems that needed to be addressed and further developed. Finally, as the final product in the last stage (Stage 4), the overall satisfaction was at a high level (m = 4.43). The SOCIEMO website (Fig. 52) has six primary features and functions: dashboard, profile setting, team members section, interactive review component, sharing & empathy section, and an emotion reflection tool.

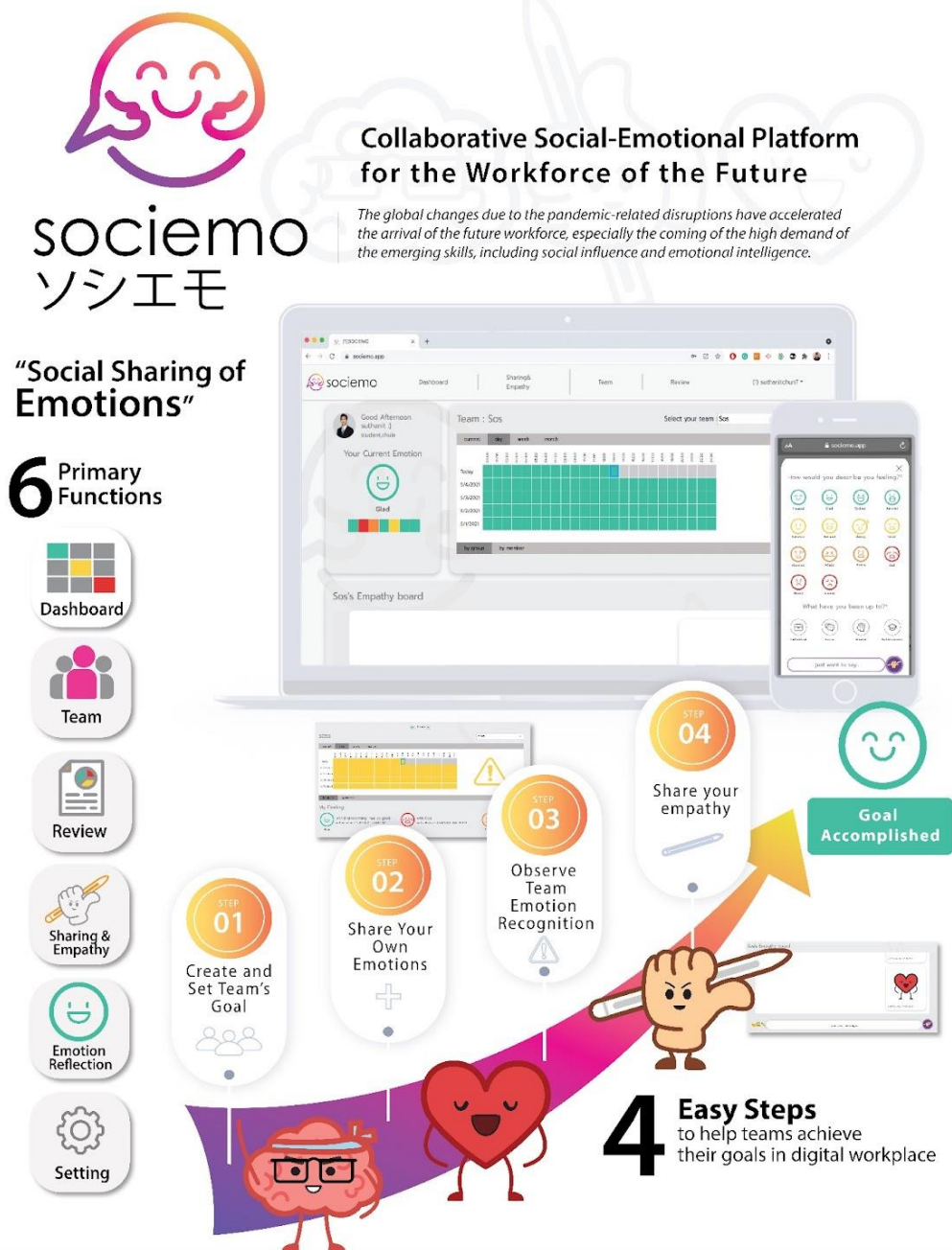


Figure 53 Poster of the collaborative social-emotional platform

The step-by-step guideline for using the platform is as follows: create and set the team's goal, share your own emotions, observe team emotion recognition, and share your empathy (as depicted in Fig. 54-59)

6 primary functions



Figure 54 Six primary functions of the “Sociemo experimental platform”

STEP 1 Create and set team's goal

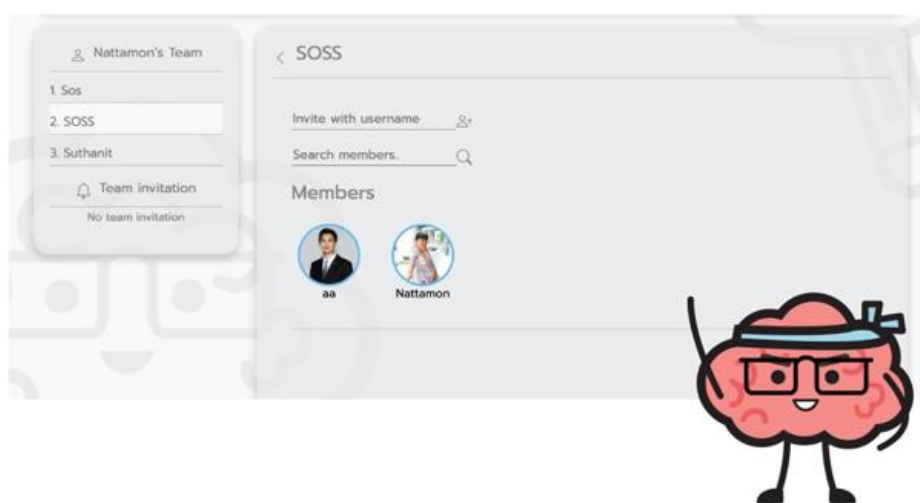


Figure 55 Step 1, create and set team's goal



Figure 56 Step 2, share your own emotions

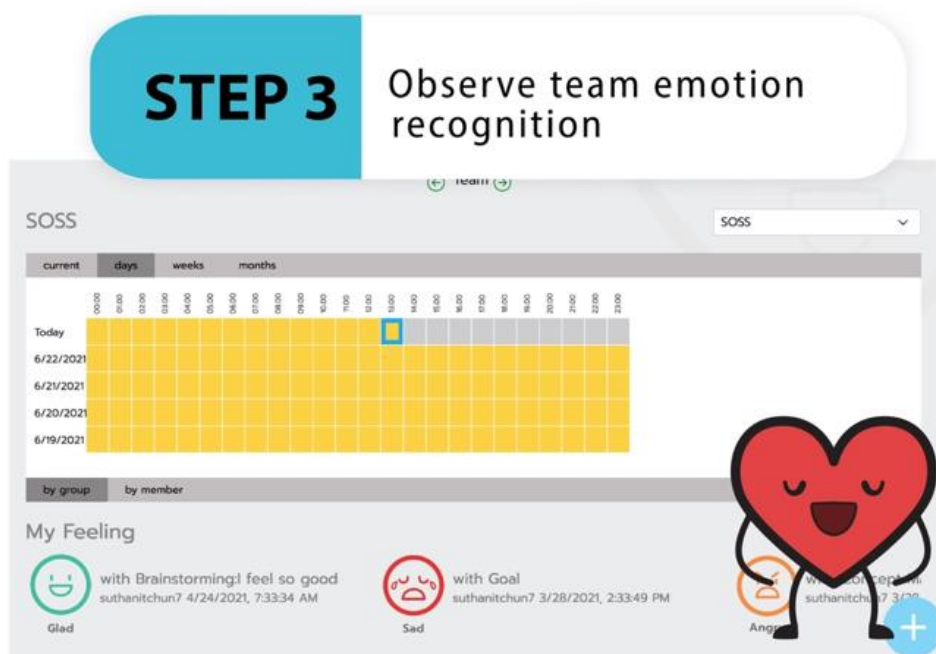


Figure 57 Step 3, observe team emotion recognition

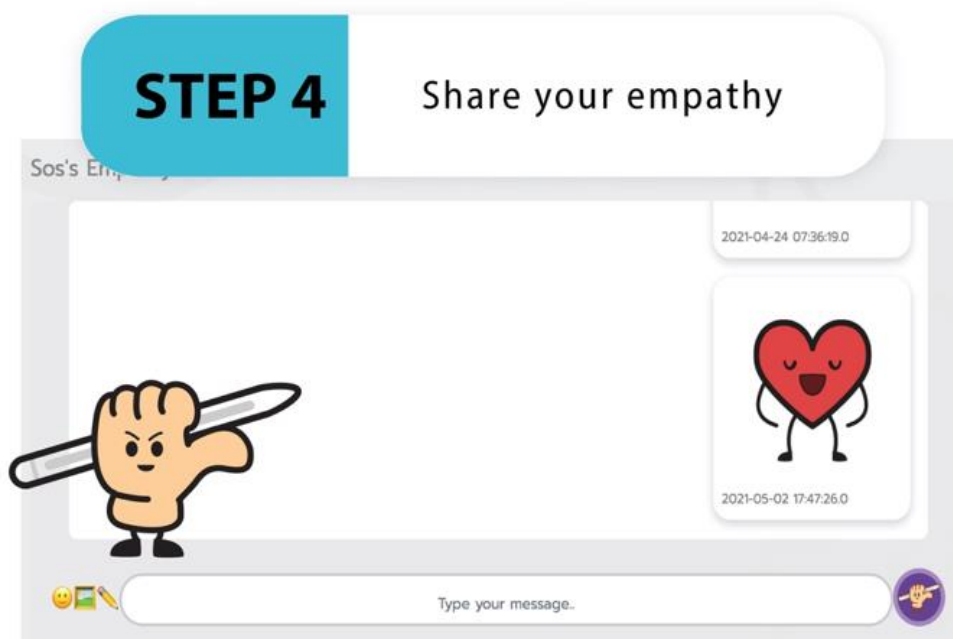


Figure 58 Step 4, share your empathy

Seeing below, the entire web page screen is presented as the final product.



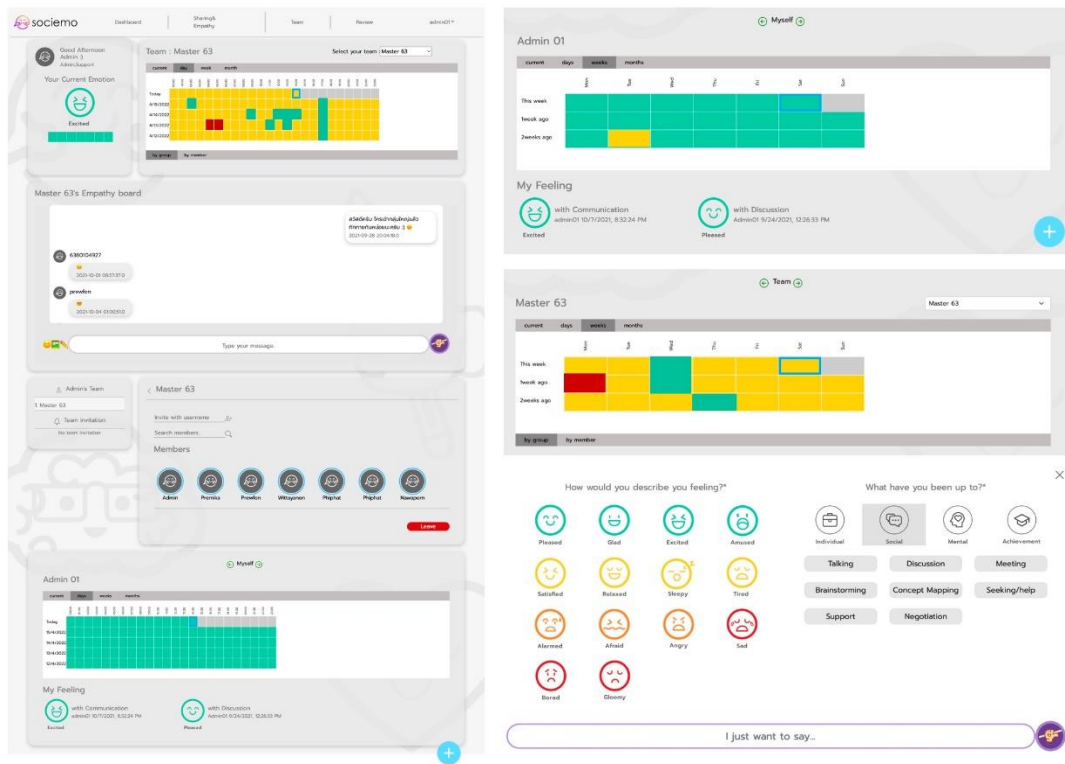


Figure 59 The “Sociemo” full web page screen capture



CHAPTER VI

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Chapter Overview

The research titled “A Learning and development with a collaborative note-taking model for enhancing higher education students’ workforce skills in socio-emotional regulation and grit based on a web 5.0 approach” has the following four research objectives.

- 1) To investigate socio-emotional regulation framework to promote higher education students' future workforce skills in social and emotional regulation and grit.
- 2) To investigate how socio-emotional regulation impacts grit based on instructional technology via online social collaborative note-taking in the web 5.0.
- 3) To define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

There were three phases of procedure to answer the above research questions:

Phase 1: To investigate the socio-emotional regulation framework to promote higher education students' workforce skills of the future in social and emotional regulation and grit.

Phase 2: To investigate how socio-emotional regulation impacts grit based on the instructional technology via online social collaborative note-taking in the web 5.0.

Phase 3: To define the design principle on the implication of the instructional technology via online social collaborative note-taking to the web 5.0.

To discuss the results of three research questions following:

- 1) What are the factors in self-regulation that affect social and emotional skills and grit?
- 2) What are the components and procedures of the learning & development (L&D) model via collaborative note-taking in the web 5.0 to develop future workforce skills in social-emotional skills and grit?
- 3) How does the empirical L&D model via online social collaborative note-taking impact instructional technology learning in the web 5.0 approach?

In this chapter, we highlighted the core results based on the three main research questions.

6.1 The factors in self-regulation that influence social and emotional skills and grit.

6.1.1 Key Results

Structural Equation Modeling (SEM) results revealed the model fit through the empirical data. The model's overall goodness-of-fit is statistically significant, indicating that it meets the model-fit criteria and provides an acceptable fit interpretation. All values are considered acceptable, the chi-square goodness-of-fit indices ($\chi^2 = 71.686$, $p = .187$, $\chi^2/df = 1.156$, root mean square error of approximation (RMSEA) = .021, comparative fit index (CFI) = .999, Tucker-Lewis index (TLI) = 0.998. In summary, the fit of the hypothesized model was acceptable. Further path analysis revealed the significant, positive, and direct effect from self-regulation to socio-emotional regulation ($\beta = .392$, $p < .05$), social cognitive learning to socio-emotional regulation ($\beta = .635$, $p < .001$). Moreover, socio-emotional regulation was directly and

positively associated with social and emotional skills ($\beta = .801, p < .001$) and was directly and positively associated with grit ($\beta = 1.000, p < .001$).

6.1.2 Discussions on the factors

This study was conducted to validate the measurement models of future workforce skills, including self-regulation, social cognitive learning & development, socio-emotional regulation, social and emotional skills, and grit. Structural modeling was used to test the association hypothesis between variables, especially the endogenous variables of oriented outcome (non-cognitive attributes). The final model in this study adequately fits the data of the Thai graduate students' context well, thereby confirming the predicted association among the variables. To our knowledge, this study has been brought up in accordance with the construct validity of sub-scales and the observed relationship, which could be explained in this way.

The empirical results demonstrate that self-regulation and social cognitive learning & development were associated with socio-emotional regulation. In support of these findings, individual and social perspectives were combined and can be socially constructed when promoting socio-emotional regulation. Prior studies have noted the possibility of expanding the concept of self-regulation into co-regulation and socially shared regulation using social cognitive theory. This would be allocated into shared metacognitive regulation in a context such as collaborative learning groups (De Backer, Van Keer, & Valcke, 2020; Järvelä et al., 2015). 70:20:10 learning models can be used to create well-established learning ecosystems by delivering and leading dialogues that stimulate reflective thinking and ongoing learning. Additionally, it was suggested by Johnson et al. (2018) that future research seeks to explicate the role of social learning in supporting the efficacy of both formal and experiential learning. This means that learning is not only formal training but also learning with others and practicing skills in on-the-job contexts (Kang, 2019). This

practical learning and development program combine formal, social, and experiential appearances.

Moreover, the results of the current study found that socio-emotional regulation also reflected social and emotional skills. Not surprisingly, previous research showed strong evidence of validated intervention, such as a social web-based environment that contributed to an active, collaborative learning setting (Molinillo et al., 2018). Concerning the emotional perspective, it is indicated that individuals who experience emotions are motivated to share a person's social environment experience with others to confirm the necessity of social interaction (Rimé, 2009). Furthermore, collaboration in an online environment is a socially and emotionally challenging task in the group's productive function (Bakhtiar, Webster, & Hadwin, 2018).

The significant path's most essential and relevant findings showed that grit played a crucial role and was directly affected by social and emotional skills. We brought the discussion into two aspects: the importance of grit and the pathway through which grit is constructed. Firstly, we emphasized the importance of grit as the desired outcome for the workforce's future. Obviously, grit is considered a key factor for academic success, and gritty people or people with high grit perform positively in high academic settings in relation to motivation, self-efficacy, and oriented goals (Alhadabi & Karpinski, 2020; Fabelico & Afalla, 2020; Huéscar Hernández, Moreno-Murcia, Cid, Monteiro, & Rodrigues, 2020; Montas et al., 2021). In addition, the empirical data assumed that grit is rooted in the pathway of regulated socio-emotional development along the social and emotional learning journeys. Therefore, such connections are likely between social and emotional skills and grit. Our data suggest that the better the social and emotional skills, the more grit can be detected among graduate students. The findings in this study mirror those of

previous studies which have examined the effect of perseverance and adaptability being positively related to social-emotional learning; however, consistency was found negatively associated with social-emotional learning (Datu & Restubog, 2020). In detail, looking from a social perspective, social identities are important for the ability to persevere in an academically rigorous and grit-intensive graduate environment (Kundu, Elcott, Foldy, & Winer, 2020). Changing environments and conditions can lead to self-regulated and consistent behavioral changes, as well as changes in personality traits as a result of socialization factors (Wolff, Schmidt, Borzikowsky, Möller, & Wagner, 2020). Moreover, perceiving social support from multiple sources such as peers, classmates, and teachers, including the emotional, instrumental, informational, and appraisal in the social activity, helps learners cope more efficiently with serious situations like COVID-19, which also relates to grit (Clark, Dorio, Eldridge, Malecki, & Demaray, 2020; Hou, Yu, & Lan, 2021). In contrast, emotional experiences such as sharing personal feelings between peers could be associated with engagement and the disengagement of grit (Lan & Radin, 2020; Sung, Yih, & Wilson, 2020). As a result of our findings, we have identified the future workforce skills which have confirmed a connection between socio-emotional regulation, social and emotional skills, and grit among online graduate students. This should be considered when redesigning a digital learning activity. This paper discusses the implications of the particular emphasis integrated with socio-emotional focuses in digital learning settings for graduate students (Table 5).

6.2 The components and procedures of the learning & development (L&D) model via collaborative note-taking in the web 5.0 to develop workforce skills of the future in social-emotional skills and grit

6.2.1 Key Results

The proposed model-based theoretical root includes the factors of socio-emotional regulation and the components of design-based research proofing the web 5.0 concept. We highlight the three components that are derived from the self-regulation and learning in the social cognitive learning and development context. **Social partner, social activity, social sharing of emotion.** After the evaluation and reflection in the developmental process, the final product of the “Sociemo”, a collaborative social sharing of emotion platform, was developed. The web application was brought back to the users to produce design principles and enhance solution implementation. The “Sociemo” web application has six primary features and functions: dashboard, profile setting, team members section, interactive review component, sharing & empathy section, and an emotion reflection tool. The components of the web 5.0 concept are the following: dashboard, profile setting, team members, interactive reviewer, sharing and empathy, and emotion reflection. Furthermore, we highlighted the concept of social cognitive learning and development, which the 70:20:10 portion of learning and development has been added to the study context. There are 70% of experiential Learning activities (oral presentation, thesis seminar), 20 % of social Learning (group meeting activities between group members and advisors, social sharing of emotion), and 10% of formal online learning. After 12 weeks of the experiment, we examined the mean and standard deviation of the social and emotional skills and grit. Furthermore, a repeated-measures ANOVA was performed to compare the effect of the 70:20:10 learning and development model on social and emotional skills and grit. It has been found that the mean of social and emotional skills and grit were increasing accordingly. According to the findings, the average mean scores of the middle and post-activities combined were significantly higher than those at the beginning of the experiment. The results suggest that timing does have an effect on social and emotional skills as well as grit for words. The social and emotional skills and grit

increased significantly after the experiment, however, it should be noted that after the middle of activity time, to increase significantly.

6.2.2 Discussion of the components and procedures

The design-based research proved the web 5.0 concept. There are several possible explanations for these results. We highlight the three components derived from self-regulation and learning in the social cognitive learning and development context: **Social partner, social activity, and social sharing of emotion.**

Firstly, according to self-perspective, these findings further support the idea that elaboration and metacognition were positively correlated with positive activating emotion (Artino & Jones, 2012). Being an adult offers the adaptive capacity to solve problems more efficiently, control emotions more effectively, reduce the cognitive costs of emotion regulation, and create a flexible developmental trajectory for emotional control (Blanchard-Fields, 2009). As a result, such links may exist between regulating these emotions at the interpersonal level and developing socioemotional regulation strategies based on five themes: behavioral, interpersonal, cognitive, motivational, and a mix of motivational and cognitive (Lobczowski, Lyons, Greene, & McLaughlin, 2021).

Secondly, through the procedures of the learning & development (L&D) model via collaborative note-taking in the web 5.0 to develop workforce skills of the future in social-emotional skills and grit. The current design suggests the adaptation of 70:20:10 learning to develop research skills. This research suggests that 10% of formal Learning is derived from attending lectures/ seminars/workshops and further self-learning on research performance skills. The 70% of experiential learning came from the online oral presentation and online thesis seminar, as well as learning through case studies and conversations with experts. Lastly, the focus on 20% of social learning impacted on the social activities among group members and with advisors. This finding, while preliminary, suggests the use of collaborative note-taking

and social sharing of emotion tool. This finding, while preliminary, suggests the use of collaborative note-taking for experiential learning. Expressing empathy through expressive writing via messages, images, or videos within the group is also highlighted as a social sharing of emotion tools. According to this instructional process, we may follow these steps of collaboration planning, self/group reflection and assessment using collaborative note-taking, and reflection of one's own/group emotions and responsible for sharing empathy for others. This research supports the findings where we emphasized providing feedback to the team member about their performance and leading conversations that encourage reflective thinking (Petterd, 2016). These findings are consistent with those found in previous studies, which suggested that researchers investigate the function of social learning in enhancing the efficacy of both formal and experiential learning (Johnson et al., 2018). However, this finding has been unable to demonstrate the structure of any learning experiences beyond the formal/informal divide (Clardy, 2018).

Bringing together the self and interpersonal perspective in the context of social cognitive learning and development, social partner, social activity, and social sharing of emotion is at the heart of the developmental process. The result of the study indicates that the key elements which are embedded in web 5.0 are dashboard, profile setting, team members, interactive reviewer, sharing and empathy, and emotional reflection. The determination of these elements is derived from the socio-emotional regulation factors above. This study produced results that corroborate the findings of many previous works in the field. It is encouraging to discuss the finding in three ways which comprise of:

The factors that influence the development of socio-emotional regulation

- The factors that influence the development of socio-emotional regulation
- The proof of the web 5.0 concept with the experimental platform

- The effects of the L&D model on social and emotional skills and grit

First, the most interesting findings were the factors that influence the socio-emotional regulation development. The present finding supports previous research, which there is a required social interaction that generates the social engagement like sharing of knowledge, monitoring learning, and more socio-emotional interaction in a collaborative way (Isohätälä, Näykki, & Järvelä, 2020). Emotional sincerity should be included, and a cognitive viewpoint should be added to the existing focus on followers' affective reactions to emotional sincerity (Caza, Zhang, Wang, & Bai, 2015). As a result, cognitive and emotional obstacles in collaborative interactions are not mutually exclusive or strictly separate (Näykki, Isohätälä, & Järvelä, 2021).

This also accords with the earlier observation, which showed the taxonomy of five types of collective emotion, including emotional sharing, emotional contagion, emotional matching, emotional segregation, and emotional fusion. These taxonomies are served with the terms of social sharing of emotion, group-based emotions, or joint emotions (Thonhauser, 2022). There is a possible way to explain the concept of social partner, social activity, and social sharing of emotion. It should come as no surprise that people may communicate a positive emotional experience systematically. When it comes to unpleasant experiences. However, when it comes to unpleasant experiences, the proclivity to talk about them as soon as they occur and then discuss what happened again with various people in one's network (Rimé, 2017). Thus, empathy and experience sharing might reduce the risk of burnout in this case (Weisz & Cikara, 2021).

It can be thus be suggested that the emphasis on learning and development that goal-oriented in the 70:20:10 context dived learners to gain more academic achievement and become more gritter which is consistent with (Park et al., 2018) who emphasized the goal-oriented activity. This research encourages the use of practical implications for an instructional designer, as well as the highlighted of a

developed tool to assist students in completing their degrees and preparing them for careers (Schnefke, 2018). This study is also consistent with the previous meta-analysis, which showed the mastering academic performance, improving attitudes and behaviors, and decreasing some negative behavior during the social and emotional learning activity (Denham, 2018). The finding also supports the idea of developing social and emotional web-based assessments in advance (McKown, 2019).

6.3 The experts' opinion on the implication of the instructional technology via online social collaborative note-taking to the web 5.0

6.3.1 Key Results:

This research highlights the developmental process and the research methodology used to design and evaluate SOCIEMO. This experimental digital learning platform supports the idea of socio-emotional regulation, which will serve the workforce skills of the future in higher education in a Web 5.0 Approach. In addition, in our discussion, this work raises many important questions about the future of higher education related to socio-emotional regulation in the workforce. The implementation and the potential long-term effect of using socio-emotional regulation platforms, such as the one presented here, are also presented. Finally, it provides educational recommendations and formative guidelines in the context of education and Web 5.0.

Based on the findings, graduate students and experts agreed that in the future of workforce education, a focus on psychological well-being during professional development will be important, as will the ability of students to regulate their socio-emotional learning in real-world contexts. There is a design principle that is generated from the design research methodology; what this study added to our knowledge were:

- A socialized work environment that is more innovative, creative, and collaborative
- Perseverance demands attention and social-emotional determination in which a person has an impact on society
- Socio-emotional control tools that interact, share, and deal with others to get everyone involved

6.3.2 Reflection on the implication of the design principal

To address the reflection on the implication of the design principal, design-based research is used to contribute to theoretical understanding of learning in complex settings (Sandoval & Bell, 2004). The valuable sources of data from each phase, e.g., the self-report questionnaire, the interviews, focus groups, and reflection made the strong design principal in order to inform future development and implementation (Herrington & Reeves, 2011). In order to maximize learning, we might use conceptual models to comprehend the situation and adjust the intervention and the setting (Anderson & Shattuck, 2012). The discussion below presented the use of design principles to guide educational practice.

Since social and emotional regulation skills are increasingly becoming important factors in the pandemic-related disruptions and the future of the workforce. At the present time, consideration to transform the classroom to the “next normal” of learning is now on the move. This research aimed to design a new experimental digital learning platform to help Higher Education students develop "workforce socio-emotional regulation skills." This presentation highlights the developmental process and the research methodology used to design and evaluate SOCIEMO. Design research approaches in educational technology (Reeves, 2006) were used to analyze problems and develop solutions in 4 stages; initial, alpha, beta, and gamma. The SOCIEMO platform has six primary features and functions: dashboard, profile setting, team members section, interactive review component, sharing &

empathy section, and an emotion reflection tool. “SOCIEMO” can be easily used within four easy steps: create and set the team’s goal, share your own emotions, observe team emotion recognition, and share your empathy to help teams achieve their goals in a digital workplace. This experimental digital learning platform supports the idea of socio-emotional regulation, which will serve the workforce skills of the future in higher education in a Web 5.0 Approach. In addition, in our discussion, this work raises many important questions about the future of higher education related to socio-emotional regulation in the workforce.

The solution of practice and production design principles and design guidelines to enhance solution implementation are 1) a socialized work environment that is more innovative, creative, and collaborative, 2) perseverance demands attention and social-emotional determination in which a person has an impact on society, 3) socio-emotional regulation tools that are interacting, sharing, and dealing with others to get everyone involved. The proof of the web 5.0 concept with the experimental platform agrees with the findings of other studies. The platform can be used as a social learning content analytics related to online social learning, including collaborative learning, presence, and online cooperation. The sentiment analysis, revealing learners’ emotions such as happiness and frustration, can be useful in this case (Ferguson & Buckingham Shum, 2012). In addition, socially shared regulation should be highlighted in the way of computer-supported collaborative learning (CSCL), which embeds the socioemotional dimension: (meta) cognitive, social, motivational, and emotional (Järvelä et al., 2015). In accordance with the present results, previous studies have demonstrated the development of social learning tools, such as VLEs/LMSs: a controlled environment that gathered self, group, and course meta-data (i.e., data regarding the course structure, goals, resources) data in the form of web-based e-learning (Mangaroska & Giannakos, 2019). Another developed tool was the EmotiW tool, an audio-video emotion recognition system that recognizes image-level facial expressions and estimates group-level pleasure

intensity. The goal is to classify the collective emotion in the photos at the group level (Dhall, Goecke, & Gedeon, 2015). Moreover, the recent deployment of Emo-cog brought the concept of reflection that activates emotions among reflective, affective learners (Harvey, Baumann, & Fredericks, 2019).

Experts recommend that the system be automated, that the notification system be improved so that users can express their emotions in a timely manner, and that the target population is expanded to include learners of all ages. The findings support previous research with the concept of interactive data visualization. In alignment with the previous study, which currently explored visualization until getting their desired visualizations in the exploration process (Qin, Luo, Tang, & Li, 2020). This result also supports the idea of an analytic learning dashboard that increases self-regulation through interaction and supports the online asynchronous collaboration of multiple groups (Zheng et al., 2021).

6.4 Limitations, recommendations, implications, and conclusion

6.4.1 Limitations and recommendations

These findings enhance our understanding of the non-cognitive attributes and contribute to the current literature about social and emotional skills and grit. The present study also contributes additional evidence that suggests fostering socio-emotional regulation to promote these skills and attributes throughout a developmental lifespan. However, using the self-report technique for data collection was one of our study's limitations, as it may have led to reporting inaccuracies. Furthermore, because the study was conducted in a specific geographic region, these results may not be applied to people in different environments and cultures. Future research could be conducted at other levels and settings, not just with graduate students as a sampling group, to provide a wide range of implications for the proven hypothesis. We suggest further ethnographic research among various geographical regions to observe how groups of people develop their skills and attributes over

time. More focused research is also critically needed in this subject, particularly in relation to outcome measurement and more emphasis on design-based interventions. Another limitation of this study is the timing for implementing the prototype and experimenting with the actual learning and development plan. A longitudinal study with a wide range of time series is needed for further exploration.

Despite the fact that we experimented with web 5.0 proof concepts and produced design guidelines, there is abundant room for further progress in determining the concept of the Web 5.0. The era of web was expressed by three innovations, typically associated with three phases: namely, the web of documents (web 1.0), the Web of people (web 2.0), and the web of data (the still-to-be-realized web 3.0) (Choudhury, 2014). Recently, the web has transformed into a platform that generates interactions in order to provide users with rich, emotionally resonant experiences. Especially in web 5.0, will be more tailored to the user's degree of arousal and information receptivity (Kambil, 2008). Firstly, we suggest recommendations for further research on the future directions of Web 5.0. There are rooms for improvement with a better and scientific emotion recognition to make the emotion recognition more automated. For example, the uses of log files, eye tracking, and physiological sensors (Azevedo et al., 2017). The distinction between authentic and factitious emotions and access to "pure emotions" will be possible in the near future (Salmela, 2005). With the help of new technology, better groups experienced more socio-cognitive challenges than socio-emotional challenges, according to an intelligent emotion recognition system for mobile phones that uses machine learning techniques (Zuolkernan, Aloul, Shapsough, Hesham, & El-Khorzaty, 2017). There will be a technology tool that helps develop socio-emotional regulation. For example, the innovative virtual reality experiment was created to examine an element of social emotion regulation in adolescents with and without neurodevelopmental problems, namely the impact of social support on self-

regulation. The scenario and a virtual agent who provides emotion should be developed to be more realistic (Stallmann et al., 2022).

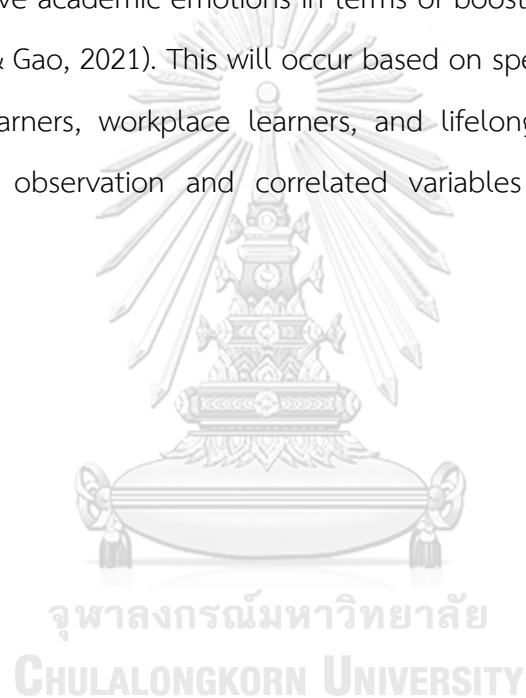
6.4.2 Implications and conclusion

Our findings echo previous scholarly efforts, which can offer several implications for policy and practice. Firstly, it outlines citizens' future skills and how individual development relates to its social environment. Graduate students must have social and emotional skills as well as grit. In fact, students who perceived their learning as more mastery goal-oriented were grittier regarding high academic achievement (Park et al., 2018). However, to attain significant academic achievements, not only should a high level of thinking be formed, but the mental process of grit should also be considered. This mentioned attribute may lead to people's behavior and activities toward online learning, especially during difficult moments such as when the COVID-19 pandemic spread across the planet (Nussbaum et al., 2021).

This study also suggests some of the practical implications for an instructional designer and the highlighted need for a tool to assist students in completing their degrees and preparing them for careers (Schnefke, 2018). Empirical evidence types of intervention are required for actual evidence to back up the study in a theoretically robust manner. As previous research attempted to develop some interventions such as social and emotional web-based assessment (McKown, 2019). It can be considered as an opportunity for instructors or instructional designers to establish more creative and innovative pedagogies to support students in the development of grit through new teaching and learning activities (Chonody, 2021), for example web-based application and e-learning platform (Fidel Kinori S, 2022; Malureanu, Panisoara, & Lazar, 2021). Another area of inquiry may be investigations of how emotional exchange occurs in web interactions, as well as an analysis of the value of this emotional communication for people's well-being (Benito-Osorio et al., 2013). The design of social web-based collaborative learning (SWBCL), in which teacher-student

interaction has a significant impact on students' active learning, both directly and indirectly, via emotional engagement (Molinillo et al., 2018) could be considered.

Finally, all the factors discussed in this study are critical in providing some of the guidance to be used when preparing for the workforce's future skillsets. Currently, the task becomes difficult when, as part of the digital learning process, users' learning styles and emotional behavior can be identified and analyzed using web-based approaches (Rathi et al., 2021). It is seen that positive academic emotions outperform negative academic emotions in terms of boosting academic performance (Tan, Mao, Jiang, & Gao, 2021). This will occur based on specific theories and across a wide range of learners, workplace learners, and lifelong learners who described variability among observation and correlated variables drawn from the design principal.



Appendix



จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

Appendix 1: Certificate of IRB Approval



Office of the Research Ethics Review Committee for Research Involving Human Subjects:
The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts
Chamchuri 1 Building, Room 114, Phayathai Road, Wang Mai Sub-district,
Pathum Wan District, Bangkok 10330
Telephone number 0 2218 3210-11 E-mail curec2.ch1@chula.ac.th

COA No. 243/2563

Certificate of Research Approval

Research Project Number 225/63 A LEARNING AND DEVELOPMENT WITH COLLABORATIVE
NOTE- TAKING MODEL FOR ENHANCING THE FUTURE HIGHER EDUCATION STUDENTS'
WORKFORCE SKILLS IN SOCIO- EMOTIONAL REGULATION AND GRIT BASED ON A WEB 5.0
APPROACH

Principal Researcher Mr. Suthanit Wetcho

Office Faculty of Education, Chulalongkorn University

The Research Ethics Review Committee for Research Involving Human Subjects: The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts at Chulalongkorn University, based on Declaration of Helsinki, the Belmont report, CIOMS guidelines and the Principle of the international conference on harmonization – Good clinical practice (ICH-GCP) has approved the execution of the aforementioned research project.

Signature *Theraphan Luangthongkum* **Signature** *Nunghatai Rangponsumrit*
(Emeritus Prof. Theraphan Luangthongkum, PhD.) (Asst. Prof. Nunghatai Rangponsumrit, PhD.)
Chairman Secretary

Research Project Review Categories: Expedited Review

Date of approval: 21 December 2020

Expiry date: 20 December 2021

Documents approved by the Committee:

1. The research proposal
2. The researcher CV
3. The information sheets for research participants
4. The informed consent forms
5. The questionnaires



Protocol No.....	225/63
Date of Approval.....	21 DEC 2020
Approval Expiry Date.....	20 DEC 2021

Conditions

1. The researcher has acknowledged that it is unethical if he/she collects information for the research before the application for an ethics review has been approved by the Research Ethics Review Committee.
2. If the certificate of the research project expires, the research execution must come to a halt. If the researcher wishes to reapply for approval, he/she has to submit an application for a new certificate at least one month in advance, together with a research progress report.
3. The researcher must conduct the research strictly in accordance with what is specified in the research project.
4. The researcher must **only** use documents that provide information for the research sampling population/participants, their letters of consent and the letters inviting them to take part in the research (if any) that have been endorsed with the seal of the Committee.
5. If any seriously untoward incident happens to the place where the research information, which has requested the approval of the Committee, is kept, the researcher must report this to the Committee within five working days.
6. If there is any change in the research procedure, the researcher must submit the change for review by the Committee before he/she can continue with his/her research.
7. For a research project of less than one year the researcher must submit a report of research termination (AF 03.13) and an abstract of the research outcome within thirty days of the research being completed. For a research project which is a thesis, the researcher must submit an abstract of the research outcome within thirty days of the research being completed. This is to be used as evidence of the termination of the project.
8. A research project which has passed the Exemption Review, must observe only the conditions in 1, 6 and 7.

Appendix 2:

List of experts validating the research instruments

Content validation through expert judgement of an instrument

1. Self-report questionnaire

Assoc. Prof.Panita Wanpiroon, Ph.D.

Faculty of Technical Education,

King Mongkut's University of Technology North Bangkok

Asst. Prof.Natwadee Nantapinai, Ph.D.

Faculty of Education, Chulalongkorn University

Assoc. Prof.Suchada Bowarnkitiwong, Ph.D.

Faculty of Education, Chulalongkorn University

Asst. Prof.Piyawan Visessuvanapoom, Ph.D.

Faculty of Education, Chulalongkorn University

Asst. Prof.Pornpimol Sukavatee, Ph.D.

Faculty of Education, Chulalongkorn University

2. User satisfaction survey, and model evaluation form

Prof.Naowanit Songkram, Ph.D.

Faculty of Education, Chulalongkorn University

Prof.Jintawee Khlaisang, Ph.D.

Faculty of Education, Chulalongkorn University

Assoc. Prof.Prakob koraneekij, Ph.D.

Faculty of Education, Chulalongkorn University

3. Social activity learning and development plan

Prof.Jintawee Khlaisang, Ph.D.

Faculty of Education, Chulalongkorn University

Chamaiporn Inkaew, Ph.D.

Faculty of Education, Prince of Songkla University

Aree Imsombat, Ph.D.

Equitable Education Fund (EEF) of Thailand

4. Expert judgement of the learning and development model

Prof.Jintawee Khlaisang, Ph.D.

Faculty of Education, Chulalongkorn University

Assoc. Prof.Prakob koraneekij, Ph.D.

Faculty of Education, Chulalongkorn University

Assoc. Prof.Siwanit Autthawuttikul, Ph.D.

Silpakorn University, Sanam Chandra Palace Campus

Assoc. Prof.Panita Wanpiroon, Ph.D.

Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok

Chamaiporn Inkaew, Ph.D.

Faculty of Education, Prince of Songkla University

5. Semi-structure interview experts

Prof.J. Ana Donaldson, Ph.D.

Past President AECT, University of Northern Iowa

Prof.Charles Xiaoxue Wang, Ph.D.

Department of Educational Leadership, Technology and Research,
Florida Gulf Coast University

Prof.Prachyanun Nilsook, Ph.D.

Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok

Prof.Jintawee Khlaisang, Ph.D.

Faculty of Education, Chulalongkorn University

Asst. Prof.Ubonwan Hongwityakorn, Ph.D.

Faculty of Education, Chulalongkorn University

Appendix 3: Results of Index of Item Objective Congruence: IOC
(In English and Thai)

3.1 Self-Report in Social and Emotional Self-Regulation of Higher Education Students

Instructions

+1 means ensuring that the questions are measured according to the content and purpose.

0 means not sure if the question is translated according to the content and purpose

-1 means that the measurement questionnaire does not match the content and purpose

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
การกำกับตนเอง (Self-Regulation)								
การกำกับตนเองทางพฤติกรรม (Behavior Regulation)								
1.	I figure out my goals and what I need to do to accomplish them. ฉันตั้งเป้าหมายและรายการที่ต้องทำเพื่อให้งานสำเร็จ	1	1	1	1	1	1.0	Item can be used.
2.	I know how much of a task I have to complete. ฉันรู้ว่ามึปริมาณงานมากแค่ไหนที่ต้องทำให้สำเร็จ	1	1	1	1	1	1.0	Item can be used.
3.	I think about my actions to see whether I can improve them. ฉันคิดเกี่ยวกับการปฏิบัติงานของตนเองเพื่อดูว่าจะสามารถพัฒนา	1	1	1	1	1	1.0	Item can be used.

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	อย่างไรได้บ้าง							
การกำกับตนเองทางปัญญา (Cognitive Regulation)								
4.	When it comes to learning, I know how I learn best. เมื่อถึงเวลาเรียนรู้ ฉันรู้ว่าวิธีการเรียนแบบไหนที่ดีที่สุดสำหรับตัวฉัน	1	1	1	1	1	1.0	Item can be used.
5.	I think of several ways to solve a problem and then choose the best one. ฉันคิดหาวิธีการแก้ปัญหาที่หลากหลายและเลือกวิธีการที่ดีที่สุด	1	1	1	1	1	1.0	Item can be used.
6.	I am confident that I could deal efficiently with unexpected events. ฉันมั่นใจว่าฉันสามารถรับมือกับเหตุการณ์ที่ไม่คาดคิดได้อย่างมีประสิทธิภาพ	1	1	1	1	0	0.8	Item can be used.
การกำกับตนเองทางอารมณ์ (Emotion Regulation)								
7.	I think that I have to accept that this has happened ฉันคิดว่าฉันต้องยอมรับสิ่งที่เกิดขึ้น ปรับแก้เป็น: ฉันคิดว่าฉันต้องยอมรับผลของการกระทำที่เกิดขึ้น	1	-1	1	1	0	0.4	Edited Added context
8.	I think of pleasant things that have nothing to do with it. ฉันคิดถึงสิ่งที่น่าสนใจที่ไม่มีอะไรเกี่ยวข้องกับงาน ปรับแก้เป็น: ฉันคิดถึงสิ่งที่น่าสนใจที่	1	-1	1	1	0	0.4	Edited Added context

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	ไม่เกี่ยวข้องกับงานขณะที่เผชิญ ความเครียด							
9.	I look for the positive sides to the matter. ฉันมองหาด้านดีของสิ่งที่เกิดขึ้น	1	1	1	1	0	0.8	Item can be used.
การเรียนรู้และพัฒนาทางสังคมเชิงพุทธิปัญญา (Social Cognitive Learning and Development)								
การเรียนรู้จากประสบการณ์ (Experiential Learning)								
10.	I learn through practicing on the job experience. ฉันเรียนรู้ผ่านการฝึกประสบการณ์ใน การปฏิบัติงาน	1	1	1	1	1	1.0	Item can be used.
11.	I develop my skills from challenging assignments. ฉันพัฒนาทักษะต่าง ๆ จากภาระงานที่ ท้าทาย	1	1	1	1	1	1.0	Item can be used.
12.	I reflect the new learning experiences from the assigned task. ฉันสะท้อนประสบการณ์การเรียนรู้ใหม่ ผ่านการปฏิบัติงานที่ได้รับมอบหมาย	1	1	1	1	1	1.0	Item can be used.
การเรียนรู้ทางสังคม (Social Learning)								
13.	I am a member of at least one learning and development group. ฉันเข้าร่วมเป็นสมาชิกในกลุ่มเรียนรู้ และพัฒนาอย่างน้อยหนึ่งกลุ่ม	1	1	1	1	1	1.0	Item can be used.
14.	I access to the experts, mentor,	1	1	1	1	1	1.0	Item can

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	or coach. ฉันสามารถเข้าถึงกลุ่มผู้เชี่ยวชาญ เมนเทอร์ หรือโค้ช							be used.
15.	I collaborate with others when learning. ฉันทำงานร่วมกับผู้อื่นในขณะที่ฉันกำลังเรียนรู้ ปรับแก้เป็น: ฉันเรียนรู้ขณะที่ทำงานร่วมกับผู้อื่น	1	0	1	1	1	0.8	Item can be used.
การเรียนรู้แบบทางการ (Formal Learning)								
16.	I learn through attending class discussion. ฉันเรียนผ่านการร่วมอภิปรายในชั้นเรียน	1	1	1	1	1	1.0	Item can be used.
17.	I use other platforms to improve my skills eg. e-learning, MOOCs. ฉันใช้แพลตฟอร์มอื่น ๆ ในการพัฒนาทักษะของตนเอง เช่น อีเลิร์นนิง มูค	1	1	1	1	0	0.8	Item can be used.
18.	I investigate additional resources from various sources. ฉันตรวจสอบแหล่งข้อมูลเพิ่มเติมจากแหล่งต่าง ๆ ปรับแก้เป็น: ฉันตรวจสอบข้อมูลเพิ่มเติมจากแหล่งต่าง ๆ	1	1	1	1	0	0.8	Item can be used.
การกำกับตนเองทางอารมณ์สังคม (Socio-Emotional Regulation)								
พันธมิตรทางสังคม (Social Partner)								
19.	I would like to have a friendly chat with him (her)	1	0	1	1	1	0.8	Item can be used.

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	ฉันต้องการพูดคุยกับสมาชิกในกลุ่ม อย่างเป็นกันเอง ปรับแก้เป็น: ฉันพูดคุยกับสมาชิกใน กลุ่มอย่างเป็นกันเอง							
20.	He/she would be pleasant to be with สมาชิกในกลุ่มจะต้องรู้สึกพอใจเมื่อได้ ทำงานร่วมกัน ปรับแก้เป็น: ฉันรู้สึกพอใจเมื่อได้ ร่วมงานกับสมาชิกในกลุ่ม	1	1	-1	1	1	0.6	Item can be used.
21.	I have confidence in his (her) ability to get the job done ฉันมีความมั่นใจในความสามารถของ สมาชิกในการทำงานให้สำเร็จ	1	1	1	1	1	1.0	Item can be used.
กิจกรรมทางสังคม (Social Activity)								
22.	Let you know that she/he will be around if you need assistance สมาชิกอยู่รอบตัวฉันเสมอหากฉัน ต้องการความช่วยเหลือใด ๆ	1	1	1	1	1	1.0	Item can be used.
23.	Told you what she/he did in a situation that was similar to yours สมาชิกบอกคุณว่าพวกเขาทำอะไร ในสถานการณ์เช่นเดียวกันนี้	1	1	0	1	1	0.8	Item can be used.
24.	Shared goals and alignment of individual task perceptions and goals สมาชิกร่วมกันตั้งเป้าหมายที่สอดคล้อง	1	1	0	1	1	0.8	Item can be used.

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	กับภาระงานและเป้าหมายส่วนบุคคล ของฉัน							
การแบ่งปันทางอารมณ์สังคม (Social Sharing of Emotions)								
25.	Because happiness is contagious, I seek out other people when I'm happy เพราะความสุขสามารถส่งต่อถึงกันฉัน จึงมองหาผู้อื่นเมื่อฉันมีความสุข	1	1	1	1	1	1.0	Item can be used.
26.	I look to others for comfort when I feel upset ฉันมองหาผู้อื่นเพื่อความสบายใจเมื่อ ฉันรู้สึกไม่สบายใจ	1	1	1	1	1	1.0	Item can be used.
27.	If I'm upset, I like knowing what other people would do if they were in my situation ถ้าฉันไม่สบายใจฉันอยากรู้ว่าผู้อื่นจะ ทำอะไรถ้าพวกเขาตกอยู่ใน สถานการณ์ของฉัน	1	1	1	1	1	1.0	Item can be used.
ทักษะทางสังคมอารมณ์ (Social and Emotional Skills)								
ความตระหนักในตนเอง (Self-Awareness)								
28.	I accurately assess my strengths or weaknesses. ฉันประเมินจุดแข็งหรือจุดอ่อนของ ตนเองอย่างแม่นยำ ปรับแก้เป็น: I accurately assess my strengths or weaknesses.	1	1	1	0	1	0.8	Item can be used.
29.	I know what skills/areas I must improve in.	1	1	1	1	1	1.0	Item can be used.

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	ฉันรู้ว่าฉันต้องปรับปรุงทักษะหรือ ขอข้ายด้านใดบ้าง							
30.	I confident that I can develop the new skills and obtain the required knowledge. ฉันมั่นใจว่าฉันสามารถพัฒนาทักษะ ใหม่และได้รับความรู้ที่จำเป็น ปรับแก้เป็น: I am confident that I can develop new skills and obtain the required knowledge.	1	1	1	1	1	1.0	Item can be used.
การจัดการตนเอง (Self-Management)								
31.	I finish what I start without losing control. ฉันทำสิ่งที่ฉันเริ่มต้นไว้สำเร็จโดยไม่ สูญเสียการควบคุมตนเอง	1	1	1	1	1	1.0	Item can be used.
32.	I know how to handle and manage stress very well. ฉันรู้วิธีรับมือและจัดการกับ ความเครียดเป็นอย่างดี	1	1	1	1	1	1.0	Item can be used.
33.	I can complete my work according to the timeline. ฉันสามารถทำงานให้เสร็จทันเวลา	1	1	1	1	1	1.0	Item can be used.
ความตระหนักทางสังคม (Social Awareness)								
34.	I share the same value by setting goals with others in the group. ฉันแบ่งปันคุณค่าร่วมกันโดย ตั้งเป้าหมายร่วมกับสมาชิกคนอื่น ๆ ใน กลุ่ม	1	1	1	1	1	1.0	Item can be used.

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
35.	I usually understand how others in the group feel. โดยปกติฉันจะเข้าใจว่าสมาชิกคนอื่น ๆ ในกลุ่มรู้สึกอย่างไร	1	1	1	1	1	1.0	Item can be used.
36.	I recognize the value of others and respect the diversity and inclusiveness. ฉันตระหนักถึงคุณค่าของผู้อื่น เคารพในความหลากหลายและความเสมอภาค	1	1	1	1	1	1.0	Item can be used.
ทักษะความสัมพันธ์กับผู้อื่น (Relationship Skills)								
37.	I usually present a well-organized idea to other clearly. ฉันมักจะนำเสนอแนวคิดที่มีการจัดระเบียบอย่างดีให้กับผู้อื่น ปรับแก้เป็น: ฉันมักจะนำเสนอแนวคิดที่เป็นระบบให้กับผู้อื่น	1	1	1	0	-1	0.4	Edited Adjusted word
38.	I can get along with the members in the learning and development group. ฉันสามารถเข้ากับสมาชิกในกลุ่มการเรียนรู้และพัฒนาได้	1	1	1	1	1	1.0	Item can be used.
39.	I encourage each other to take responsibility for their works. ฉันร่วมเป็นกำลังใจให้กันและกันเพื่อร่วมกันรับผิดชอบในการทำงาน	1	1	1	1	1	1.0	Item can be used.
ความรับผิดชอบในการตัดสินใจ (Responsible Decision)								
40.	I can solve most problem	1	1	1	1	1	1.0	Item can

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	reasonably when I'm working. ฉันสามารถแก้ปัญหาส่วนใหญ่ได้อย่าง สมเหตุสมผลเมื่อฉันทำงาน							be used.
41.	I try to think about my past experience to see how can I make it better. ฉันพยายามคิดถึงประสบการณ์ที่ผ่าน มาเพื่อดูว่าฉันจะทำให้ดีขึ้นได้อย่างไร	1	1	1	1	1	1.0	Item can be used.
42.	I recognize both positive and negative impact of my decisions to the group. ฉันตระหนักถึงผลกระทบทั้งด้านบวก และด้านลบของการตัดสินใจของฉันต่อ กลุ่ม	1	1	1	1	1	1.0	Item can be used.
กริท (Grit)								
ความเสมอต้นเสมอปลายในความสนใจ (Consistency of Interest)								
43.	I often set a goal but later choose to pursue a different one.* ฉันมักจะตั้งเป้าหมายไว้ในครั้งแรก แต่ หลังจากนั้นก็เลือกที่จะทำตาม เป้าหมายอื่น ๆ แทนที่*	1	1	1	1	1	1.0	Item can be used.
44.	I have been obsessed with a certain idea or project for a short time but later lost interest.* ฉันหมกมุ่นอยู่กับความคิดหรืองาน บางอย่างในช่วงเวลาสั้น ๆ แต่หลังจาก	1	1	1	1	1	1.0	Item can be used.

No.	Item to consider	Experts opinion					Total	Interpretion
		1	2	3	4	5		
	นั่นก็หมดความสนใจ *							
45.	I have difficulty maintaining my focus on projects that take more than a few months to complete.* ฉันมีปัญหาในการรักษาโฟกัสในงานที่ใช้เวลานานกว่าสองสามเดือนกว่าจะเสร็จสมบูรณ์ *	1	1	1	1	1	1.0	Item can be used.
46.	New ideas and projects sometimes distract me from previous ones. * บางครั้งความคิดและงานใหม่ ๆ ก็เบนความสนใจของฉันจากงานก่อนหน้านี้ *	1	1	1	1	1	1.0	Item can be used.
ความเพียรพยายาม (Perseverance of Effort)								
47.	I finish whatever I begin. ฉันทำงานที่เริ่มต้นไว้จนสำเร็จ	1	1	1	1	1	1.0	Item can be used.
48.	Setbacks don't discourage me. ความพ่ายแพ้ไม่ทำให้ฉันท้อใจ	1	1	1	1	1	1.0	Item can be used.
49.	I am diligent. ฉันเป็นคนขยันในการทำงาน	1	1	1	1	1	1.0	Item can be used.
50.	I am a hard worker. ฉันเป็นคนทำงานหนัก	1	1	1	1	1	1.0	Item can be used.

* negative questions


3.2 User's Satisfaction Survey

Instructions

+1 means ensuring that the questions are measured according to the content and purpose.

0 means not sure if the question is translated according to the content and purpose

-1 means that the measurement questionnaire does not match the content and purpose



No.	Item	Experts opinion			Total	Interpretation
		1	2	3		
Overall experience of using the innovation package, applied from (QuestionPro, 2020)						
1.	How can you describe our innovative series? ท่านสามารถอธิบายชุดนวัตกรรมของเราได้อย่างไร	1	1	1	1	Item can be used.
2.	How would you describe your overall experience using the Innovation Pack in your own words? ท่านสามารถอธิบายประสบการณ์โดยรวมในการใช้ชุดนวัตกรรมด้วยคำพูดของตัวเองอย่างไร	1	1	1	1	Item can be used.
3.	The degree of adjective pair that best matches your opinion of the use of the innovative set.	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	ระดับที่ของคำคุณศัพท์คู่ที่ตรงกับ ความคิดเห็นของท่านต่อการใช้งาน ชุดนวัตกรรมมากที่สุด					
The use of the socio-emotional Innovation kit using a collaborative note-taking tool under the framework of Web 5.0.						
ประโยชน์ในการใช้งาน (Usefulness)						
1.	Innovative suites support the achievement of goals at work. ชุดนวัตกรรมช่วยส่งเสริมการบรรลุเป้าหมายในการทำงาน	1	1	1	1	Item can be used.
2.	Innovative kits promote social and emotional learning. ชุดนวัตกรรมช่วยส่งเสริมการเรียนรู้ทางอารมณ์และสังคม	1	1	1	1	Item can be used.
3.	Innovative series promote learning in the context of learning through real experiences. ชุดนวัตกรรมส่งเสริมการเรียนรู้ในบริบทการเรียนรู้ผ่านประสบการณ์จริง	1	1	1	1	Item can be used.
4.	Innovative series to promote learning in the context of learning with others. ชุดนวัตกรรมส่งเสริมการเรียนรู้ในบริบทการเรียนรู้ร่วมกับบุคคลอื่น	1	1	1	1	Item can be used.
5.	The innovative series promotes learning in formal	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	learning contexts such as classroom learning and access to learning resources. ชุดนวัตกรรมส่งเสริมการเรียนรู้ในบริบทการเรียนรู้ในรูปแบบทางการ เช่น การเรียนในชั้นเรียน และเข้าถึงแหล่งเรียนรู้					
ประสิทธิภาพการใช้งาน (Efficiency)						
6.	The innovative kit has the right size of the screen. ชุดนวัตกรรมมีขนาดของหน้าจออย่างเหมาะสม	1	1	1	1	Item can be used.
7.	Innovative packs feature styles, colors, and font sizes can be read clearly suitable for the level of learners. ชุดนวัตกรรมมีลักษณะ สี และขนาดของตัวอักษร อ่านได้ชัดเจน เหมาะกับระดับของผู้เรียน	1	1	1	1	Item can be used.
8.	The innovative kit has a nice design and user friendly. ชุดนวัตกรรมมีการออกแบบที่ดี เป็นมิตรต่อผู้ใช้	1	1	1	1	Item can be used.
9.	The innovative kit can quickly switch between different functions. ชุดนวัตกรรมสามารถทำงานสลับฟังก์ชันต่าง ๆ ได้อย่างรวดเร็ว	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
10.	Users encountered few innovations in the implementation of the innovation kit. ผู้ใช้พบข้อผิดพลาดในการใช้งานชุดนวัตกรรมน้อย	1	1	1	1	Item can be used.
ประสิทธิผลการใช้งาน (Effectiveness)						
11.	The innovation kit facilitates collaboration with group members. ชุดนวัตกรรมเอื้อต่อการทำงานร่วมกับสมาชิกในกลุ่ม	1	1	1	1	Item can be used.
12.	Innovative kit facilitates social participation activities. ชุดนวัตกรรมเอื้อต่อการทำกิจกรรมการมีส่วนร่วมทางสังคม	1	1	1	1	Item can be used.
13.	The innovative kit facilitates the exchange and sharing of emotions. ชุดนวัตกรรมเอื้อต่อการแลกเปลี่ยนและแบ่งปันอารมณ์	1	1	1	1	Item can be used.
14.	Innovative kit facilitates strategy formulation and work planning. ชุดนวัตกรรมเอื้อต่อการกำหนดกลยุทธ์และวางแผนการทำงาน	1	1	1	1	Item can be used.
15.	Innovative kit facilitates self-regulation to accomplish	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	tasks. ชุดนวัตกรรมเอื้อต่อการกำกับ ตนเองในการทำงานให้สำเร็จ					
16.	Innovative kit facilitates self- assessment, self-reflection. ชุดนวัตกรรมเอื้อต่อการประเมิน ตนเอง สะท้อนตนเอง	1	1	1	1	Item can be used.
17.	Innovative kit meets the needs of future work. ชุดนวัตกรรมตอบสนองความ ต้องการในการทำงานในอนาคต	1	1	1	1	Item can be used.
ความสามารถในการเรียนรู้การใช้งาน (Learnability)						
18.	The innovative kit is easy to use. ชุดนวัตกรรมมีความง่ายต่อการ ใช้งาน	1	1	1	1	Item can be used.
19.	Users can learn how to use the innovative kit on their own. ผู้ใช้สามารถเรียนรู้วิธีการใช้ ชุดนวัตกรรมได้ด้วยตนเอง	1	1	1	1	Item can be used.
20.	Users can come back to learn how to use it again in a short time. ผู้ใช้สามารถกลับมาเรียนรู้วิธี การใช้งานใหม่อีกครั้งในระยะเวลาอันสั้น	1	1	1	1	Item can be used.
21.	The innovation kit has an appropriate support system.	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	ชุดนวัตกรรมมีระบบการให้ความช่วยเหลือที่เหมาะสม					
ความพึงพอใจในการใช้งาน (Satisfaction)						
22.	The innovative kit meets the needs of users very well. ชุดนวัตกรรมตอบสนองความต้องการของผู้ใช้งานได้เป็นอย่างดี	1	1	1	1	Item can be used.
23.	The innovative kit is attractive and functional. ชุดนวัตกรรมมีความดึงดูดใจ น่าใช้งาน	1	1	1	1	Item can be used.
24.	Innovative kit answer the model of learning and self-development ชุดนวัตกรรมตอบโจทย์รูปแบบการเรียนรู้และพัฒนาของตนเอง	1	1	1	1	Item can be used.
25.	Users feel they should recommend or distribute the innovation kit to others. ผู้ใช้งานเห็นว่าควรแนะนำหรือเผยแพร่ชุดนวัตกรรมให้บุคคลอื่น	1	1	1	1	Item can be used.
การเข้าถึงการใช้งาน (Accessibility)						
26.	Innovative kit can be easily accessed in a short time. ชุดนวัตกรรมสามารถเข้าถึงการใช้งานได้โดยง่ายในระยะเวลาอันสั้น	1	1	1	1	Item can be used.
27.	The innovative kit is accessible from any device.	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	ชุดนวัตกรรมสามารถเข้าถึงได้จาก ทุกอุปกรณ์					
28.	The innovative kit has clear instructions for use. ชุดนวัตกรรมมีคำแนะนำการใช้งาน ที่ชัดเจน	1	1	1	1	Item can be used.
29.	Innovative kit has suitable user manuals. ชุดนวัตกรรมคู่มือสำหรับผู้ใช้ที่ เหมาะสม	1	1	1	1	Item can be used.
ความพึงพอใจในภาพรวม						
30.	Overall, at what level are users satisfied with the use of the innovation package? โดยภาพรวมผู้มีความพึงพอใจต่อ การใช้งานชุดนวัตกรรมอยู่ในระดับ ใด	1	1	1	1	Item can be used.

3.3 Innovation Experts Validation

Instructions

+1 means ensuring that the questions are measured according to the content and purpose.

0 means not sure if the question is translated according to the content and purpose

-1 means that the measurement questionnaire does not match the content and purpose

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
1.1 Factors that motivate improvement						
feasibility of implementing and promoting the spread of innovation packs, according to (McKenney & Reeves, 2019)						
Checking assumptions and understanding						
1.	What other factors do you see that will drive the continued adoption, adoption and maintenance of the innovation suite? ท่านเห็นว่ามีปัจจัยอื่นใดอีกบ้างที่จะสร้างการยอมรับ การนำไปใช้ และการบำรุงรักษาชุดนวัตกรรมอย่างต่อเนื่อง	1	1	1	1	Item can be used.
2.	What do you see that we can check or measure success? ท่านเห็นว่าเราสามารถตรวจสอบหรือวัดความสำเร็จได้จากอะไรบ้าง	1	1	1	1	Item can be used.
Innovation set factors (value added, clarity, compatibility, and durability)						

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
3.	<p>You see that this innovation to meet the needs and support the user's work at what level?</p> <p>ท่านเห็นว่าชุดนวัตกรรมนี้ตอบสนองความต้องการและสนับสนุนการทำงานของผู้อยู่ในระดับใด</p>	1	1	1	1	Item can be used.
4.	<p>Do you think this innovation package promotes ownership?</p> <p>ท่านคิดว่าชุดนวัตกรรมนี้ส่งเสริมความเป็นเจ้าของหรือไม่</p>	1	1	1	1	Item can be used.
5.	<p>Do you think this innovative kit can make it even better?</p> <p>By taking advantage of strengths, opportunities, and mitigating weaknesses and threats in targeting?</p> <p>ท่านคิดว่าชุดนวัตกรรมนี้สามารถทำให้ดีกว่าเดิม โดยใช้ประโยชน์จากจุดแข็ง โอกาส และลดจุดอ่อนรวมทั้งภัยคุกคามในการตั้งเป้าหมายหรือไม่</p>	1	1	1	1	Item can be used.
6.	<p>Do you think the design model and/or prototype need to be modified? and in what part?</p> <p>ท่านคิดว่าโมเดลการออกแบบและ / หรือต้นแบบจำเป็นต้องมีการแก้ไขหรือไม่ และในส่วนใดบ้าง</p>	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
7.	<p>What elements of the innovation kit seem obvious? And which elements cause confusion?</p> <p>องค์ประกอบใดของชุดนวัตกรรมที่ดูเหมือนจะชัดเจน และองค์ประกอบใดทำให้เกิดความสับสน</p>	1	1	1	1	Item can be used.
8.	<p>What elements of the innovation suite are not sufficiently functional?</p> <p>องค์ประกอบใดของชุดนวัตกรรมที่ไม่สามารถนำไปใช้งานได้เพียงพอ</p>	1	1	1	1	Item can be used.
1.2 Factors that promote acceptance, use, maintenance and extension						
1	<p>acceptance</p> <p>- What else can the developer do? to promote the acceptance of innovation</p> <p>- Is this design consistent or inconsistent with what is already on the market?</p> <p>- How does the user perceive it? What evidence is there for sure?</p> <p>ด้านการยอมรับ</p> <p>-มีอะไรอีกบ้างที่ผู้พัฒนาสามารถทำได้ เพื่อส่งเสริมการยอมรับนวัตกรรม</p> <p>-การออกแบบนี้สอดคล้องหรือ</p>	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	<p>ขัดแย้งกับสิ่งที่มีอยู่แล้วในตลาดหรือไม่</p> <p>-ผู้ใช้มีการรับรู้อย่างไรบ้าง มีหลักฐานอะไรที่แสดงให้เห็นได้ชัดเจน</p>					
2	<p>Usage</p> <p>- Does the resource meet the planned work?</p> <p>-What factors are involved in the design influence of usability?</p> <p>- Basic knowledge skills and attitude Does the user support the use of the innovation package sufficiently?</p> <p>ด้านการใช้งาน</p> <p>-ทรัพยากรตอบสนองการทำงานได้ตามแผนหรือไม่</p> <p>-ปัจจัยใดบ้างที่เกี่ยวข้องกับอิทธิพลจากการออกแบบการใช้งาน</p> <p>-พื้นฐานความรู้ ทักษะและทัศนคติของผู้ใช้สนับสนุนการใช้งานชุดนวัตกรรมอย่างเพียงพอหรือไม่</p>	1	1	1	1	Item can be used.
3	<p>Ongoing maintenance</p> <p>What data can the innovation kit use that could have a positive influence on sustainability in use?</p> <p>- What system factors? that</p>	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	<p>can be changed to create sustainability in use</p> <p>-How are future users perceived about the innovation package? And what factors are necessary for sustainability in use?</p> <p>ด้านการบำรุงรักษาต่อเนื่อง</p> <p>-ชุดนวัตกรรมสามารถใช้ข้อมูลใดบ้างที่อาจมีอิทธิพลเชิงบวกต่อความความยั่งยืนในการใช้งาน</p> <p>-ปัจจัยของระบบใดบ้าง ที่สามารถเปลี่ยนแปลงเพื่อสร้างความยั่งยืนในการใช้งาน</p> <p>-ผู้ที่ใช้งานต่อไปมีการรับรู้ต่อชุดนวัตกรรมอย่างไร และมีปัจจัยใดที่จำเป็นต่อความยั่งยืนในการใช้งาน</p>					
4	<p>Publication</p> <p>-Which publishing strategy is working (or not) and why?</p> <p>-What system mechanisms can be used for propagation?</p> <p>-How can we create wider awareness?</p> <p>ด้านการเผยแพร่</p> <p>-กลยุทธ์การเผยแพร่ใดที่ใช้ได้ผล (หรือไม่) และเพราะเหตุใด</p> <p>-กลไกของระบบใดบ้างที่สามารถใช้เพื่อการเผยแพร่ได้</p>	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	-เราจะสามารถสร้างการรับรู้ในวงกว้างได้อย่างไรบ้าง					
5	<p>Diffusion</p> <p>-Which spread strategy works (or not) and why?</p> <p>-How can we improve the diffusion process?</p> <p>- Are there system factors that help or hinder the spread?</p> <p>-Is the series of innovations distributed to a wider audience and how?</p> <p>ด้านการแพร่กระจาย</p> <p>-กลยุทธ์การแพร่กระจายใดที่ใช้ได้ผล (หรือไม่) และเพราะเหตุใด</p> <p>-เราจะพัฒนากระบวนการแพร่กระจายได้อย่างไร</p> <p>-มีปัจจัยของระบบที่ช่วยหรือขัดขวางการแพร่กระจายหรือไม่</p> <p>-ชุดนวัตกรรมนี้ถูกเผยแพร่สู่ผู้ชมในวงกว้างหรือไม่และอย่างไร</p>	1	1	1	1	Item can be used.
2. Accreditation assessment form						
Questions updated from (Holden & Karsh, 2010; Lee et al., 2015)						
Perceived usefulness						
1.	Useful for work มีประโยชน์สำหรับงาน	1	1	1	1	Item can be used.
2.	Help build productivity ช่วยสร้างผลิตภาพ	1	1	1	1	Item can be used.
3.	Improves effectiveness	1	1	1	1	Item can

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
	ช่วยเพิ่มประสิทธิผลของงาน					be used.
4.	Help to get the job done faster ช่วยให้งานสำเร็จได้เร็วขึ้น	1	1	1	1	Item can be used.
5.	Improve work efficiency ปรับปรุงประสิทธิภาพของงาน	1	1	1	1	Item can be used.
Perceived ease of use						
6.	Easy to use ใช้งานง่าย	1	1	1	1	Item can be used.
7.	Clear and understandable ชัดเจนและเข้าใจได้	1	1	1	1	Item can be used.
8.	Easy to do what you want ง่ายต่อการทำสิ่งที่คุณต้องการ	1	1	1	1	Item can be used.
9.	Easy to learn to use ง่ายต่อการเรียนรู้การใช้งาน	1	1	1	1	Item can be used.
10.	Flexible to use/interactive มีความยืดหยุ่นในการใช้ / โต้ตอบ	1	1	1	1	Item can be used.
Attitude toward using						
11.	The function of this innovation meets the needs of the learners. ฟังก์ชันของนวัตกรรมนี้ตอบสนองความต้องการของผู้เรียน	1	1	1	1	Item can be used.
12.	I am very satisfied with this innovation. ฉันรู้สึกพอใจกับนวัตกรรมนี้มาก	1	1	1	1	Item can be used.
13.	I feel this innovation is valuable. ฉันรู้สึกว่านวัตกรรมนี้มีคุณค่า	1	1	1	1	Item can be used.

No.	Item	Experts opinion			Total	Interpretion
		1	2	3		
14.	I feel a great positive impact for using this innovation. ฉันรู้สึกถึงผลกระทบในเชิงบวกที่ดี สำหรับการใช้นวัตกรรมนี้	1	1	1	1	Item can be used.
15.	I'm happy to download and use this innovation. ฉันยินดีที่จะดาวน์โหลดและใช้นวัตกรรมนี้	1	1	1	1	Item can be used.



Appendix 4: The self-report Factor Loading Score

Socio-emotional regulation in social and emotional learning and grit self-report

Factors	Items	Factor loading	Sources
Self-Regulation			
Behavior Regulation	I think about my actions to see whether I can improve them.	0.684	(Brown et al., 1999; Toering, Elferink-Gemser, Jonker, Heuvelen, & Visscher, 2012)
	I figure out my goals and what I need to do to accomplish them.	0.647	(Brown et al., 1999; Capa-Aydin et al., 2009; Herl et al., 1999; Hong & O'Neil Jr, 2001; Toering et al., 2012)
	I know how much of a task I have to complete.	0.606	(Hong & O'Neil Jr, 2001; Toering et al., 2012)
Cognitive Regulation	When it comes to learning, I know how I learn best.	0.721	(Howard & McGee, 2000)
	I am confident that I can deal efficiently with unexpected events.	0.645	(Herl et al., 1999; Hong & O'Neil Jr, 2001; Schwarzer & Jerusalem, 1995)
	I think of several ways to solve a problem and then choose the best one.	0.613	(Howard & McGee, 2000)
Emotion Regulation	I look for the positive sides to the matter.	0.701	(Garnefski & Kraaij, 2006)
	I think of pleasant things that have nothing to do with it.	0.609	

Factors	Items	Factor loading	Sources
	I think that I have to accept that this has happened	0.526	
Social Cognitive Learning & Development			
Experiential Learning	I reflect on the new learning experiences from the assigned task.	0.731	
	I develop my skills from challenging assignments.	0.686	
	I learn through practicing on the job experience.	0.679	
Social Learning	I am a member of at least one learning and development group.	0.736	
	I have access to the experts, mentors, or coaches.	0.659	
	I collaborate with others when learning.	0.597	
Formal Learning	I use other platforms to improve my skills, e.g. e-learning, MOOCs.	0.763	
	I investigate additional resources from various sources.	0.622	
	I learn through attending the class discussions.	0.585	
Socio-Emotional Regulation			
Social Partner	I have confidence in his/her ability to get the job done.	0.710	
	He/she would be pleased to be with.	0.573	(McCroskey & McCain, 1974)
	I would like to have a friendly chat with him/her.	0.532	
Social	They let you know that she/he will be	0.803	(Stokes & Wilson,

Factors	Items	Factor loading	Sources
Activity	around if you need assistance.		1984)
	They told you what she/he did in a situation that was similar to yours.	0.660	
	We shared goals and alignment of individual task perceptions and goals.	0.526	(Järvelä & Hadwin, 2013)
Social Sharing of Emotions	Because happiness is contagious, I seek out other people when I'm happy.	0.513	
	I look to others for comfort when I feel upset.	0.480	(Hofmann et al., 2016)
	If I'm upset, I like knowing what other people would do if they were in my situation.	0.384	
Social and Emotional Skills			
Self-Awareness	I am confident that I can develop new skills and obtain the required knowledge.	0.636	
	I accurately assess my strengths or weaknesses.	0.617	
	I know what skills/areas I must improve in.	0.608	
Self-Management	I know how to handle and manage stress very well.	0.744	
	I can complete my work according to the timeline.	0.684	
	I finish what I start without losing control.	0.666	
Social-	I share the same value by setting	0.642	

Factors	Items	Factor loading	Sources
Awareness	goals with others in the group.		
	I recognize the value of others and respect diversity and inclusiveness.	0.616	
	I usually understand how others in the group feel.	0.569	
Relationship Skills	I encourage each other to take responsibility for their works.	0.681	
	I can get along with the members of the learning and development group.	0.673	
	I usually present a well-organized idea to others clearly.	0.663	
Responsible Decision	I recognize both the positive and negative impacts on my decisions to the group.	0.720	
	I try to think about my past experience to see how can I make it better.	0.687	
	I can solve most problems reasonably when I'm working.	0.648	
Grit			
Interest	I have difficulty maintaining my focus on projects that take more than a few months to complete*.	0.608	Angela Lee
	I have been obsessed with a certain idea or project for a short time but later lost interest*.	0.464	Duckworth and Quinn (2009)
	I often set a goal but later choose to pursue a different one*.	0.443	

Factors	Items	Factor loading	Sources
	New ideas and projects sometimes distract me from previous ones*.	0.406	
Perseverance	I am a hard worker.	0.811	
	I am diligent.	0.802	
	Setbacks don't discourage me.	0.629	
	I finish whatever I begin.	0.623	



Appendix 5: Guideline Questions for empathize interview

1. Do you think the development of social-emotional learning plays an important role in the workforce skills of the future, and how?
2. Do you think accumulating perseverance (Grit) plays an important role in the skills workforce skills of the future, and how?
3. Do you think that the development of emotional social learning and in what ways is accumulation of perseverance related?
4. What types of learning contexts do you think are conducive to social-emotional learning?
5. In self-development perspective, on your opinion, do you think that good self-regulation affects social and emotional learning? And how it affects the development of long-term goals?
6. In social learning perspective, does social learning contribute to social and emotional learning? And how it affects the development of long-term goals?
7. On your view, do the current learners have the proper development of socio-emotional regulation or not and how?
8. From the current state, how do you see strengths or opportunities for the development of learners' socio-emotional regulation?
9. From current conditions, what do you think is the major weakness or obstacle in the development of learners' socio-emotional regulation?
10. What factors do you think will promote the development of socio-emotional regulation of learners?
11. What learning strategies do you think will help promote socio-emotional regulation of learners?
12. What digital tools/ functions do you think will help promote socio-emotional regulation of learners? Please give an example.
13. Do you think that the drawing / writing style can improve the socio-emotional regulation of learners? If used, what and how the format should be.

14. Do you think that the development of socio-emotional regulation of the learners in the future will change? What the learning style might change in any direction?

15. How do you expect or imagine that in the future, what kind of tools can help improve learners' socio-emotional regulation?



Appendix 6: Thesis Proposal Examination Evaluation Form

(Excerpted from the Faculty of Education) Chulalongkorn University (Only the quality thesis proposal section)

Name – Surname of the student

Topics	Results					Noted
	Very Good 5	Good 4	Moderate 3	should improve 2	should be greatly improved 1	
1. Quality of thesis proposal (60%)						
1.1 Thesis title (Thai and English)						
1.2 Background of the study (covering research problems, introduction)						
1.3 Research questions						
1.4 Research Objectives						
1.5 Definition of terms						
1.6 Conceptual Framework						
1.7 Scope of research						
1.8 Expected outcomes						
1.9 Theories and related researches						

 1.10 Research

 Methodology

 1.11 Action Plan

 1.12 References

	Total Score	Score Received(*5 /3)	/10
Total	60		

Note Criteria 85 – 100% Excellent, 75–84% Good, 60 – 74% Passed, Under 60% Fail

Sign

.....
 (.....)



Appendix 7: Instructions

Long Length Learning and Development Plan

(Grouped by thesis advisor)

Seminar in Educational Technology and Communications

Faculty of Education, Academic Year 2021

Learning and development activity structure: Online

Length: 12 Weeks (20 September -10 December 2564)

or 5 hrs./week Total 60 Hrs.

Description: This action plan is a collective goal of the group so that the members of the group can plan to prepare an individual thesis proposal* successfully. Let the members (grouped by advisor) join together to update the action plan to be current.

*This action plan is a part of Socially-Shared Regulation which does not include individual work plans.

** Please update this file by the last week of every month (31 August, 30 September, 30 October).

Group Members

1.
2.
3.
4.
5.

Advisor

1.

Group shared-goals

1.
2.
3.

Group strategies to achieve goals

1.
2.
3.

Set group learning goals according to the 70:20:10 Learning and Development

- 70% Experiential Learning
- 20 % Social Learning
- 10% Formal Learning

Type of Learning	Online Synchronous	Online Asynchronous
70%		
Experiential Learning		
20 %		
Social Learning		
10%		
Formal Learning		

Set up a group work schedule (Timeline).

To help work to meet the goals This is a group plan that does not affect personal paths.

Month	Tasks	Status	Noted
-------	-------	--------	-------

 August

 September

 October

 November

Define communication methods in formats (Telephone, Email, Line, Social Media, LMS, Conference System)

Asynchronous Communications (can be modified)

-
-
- SOCIEMO (required)

Synchronous Communications (can be modified)

Date	Channels	Topic/Title	Noted

Communications with advisors (groups) (can be modified)

Date	Channels	Topic/Title	Note



Appendix 8: Collaborative Note-Taking Screen

SOCIEMO Platform

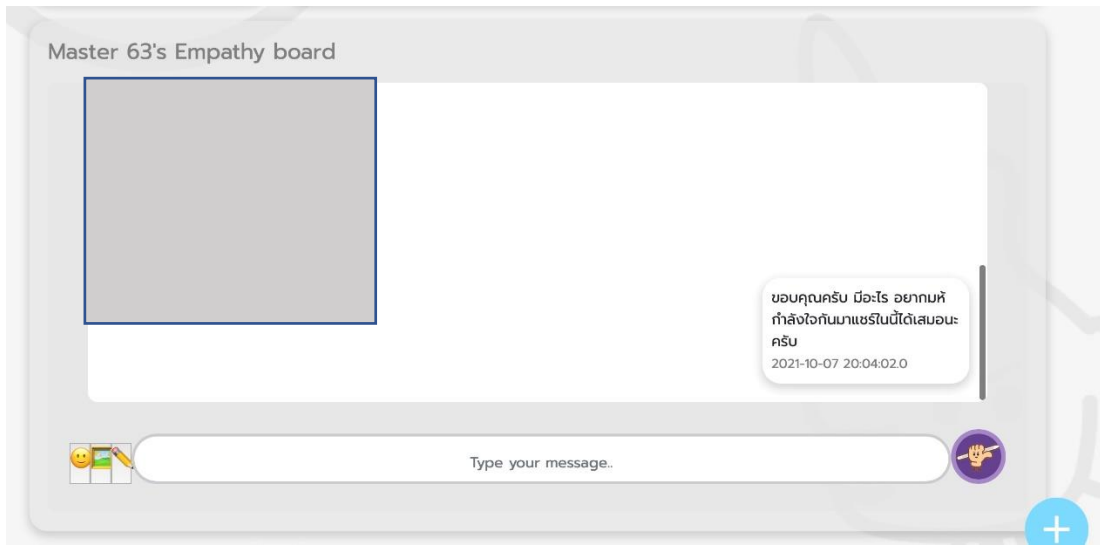
The screenshot displays the Sociemo dashboard with several panels:

- Top Navigation:** Dashboard, Sharing & Empathy, Team, Review, admin01.
- Team: Master 63:** A calendar view showing emotions for the current week, last week, and two weeks ago. The current week shows a mix of green (excited) and yellow (pleased) days.
- Admin 01:** A similar calendar view for Admin 01, showing mostly green days.
- Myself:** A panel for the user's own emotions, showing a green smiley face and the word "Excited".
- Master 63's Empathy board:** A chat interface with messages from members like "638004827" and "prafon".
- Members:** A list of team members with icons: Admin, Pramka, Prafon, Wittayanon, Phiphat, Phiphat, Nawapon.
- Admin 01 (Myself):** A panel showing "My Feeling" with two entries: "with Communication" (Excited) and "with Discussion" (Pleased).
- Team: Master 63:** Another view of the Master 63 team calendar, showing a mix of green and yellow days.
- Emotion Selection Panel:** A large panel titled "How would you describe you feeling?" and "What have you been up to?". It features 16 emotion icons (e.g., Pleased, Glad, Excited, Amused, Satisfied, Relaxed, Sleepy, Tired, Alarmed, Afraid, Angry, Sad, Bored, Gloomy) and activity icons (Talking, Discussion, Meeting, Brainstorming, Concept Mapping, Seeking/help, Support, Negotiation).
- Input Field:** A text box at the bottom with the placeholder "I just want to say..." and a microphone icon.

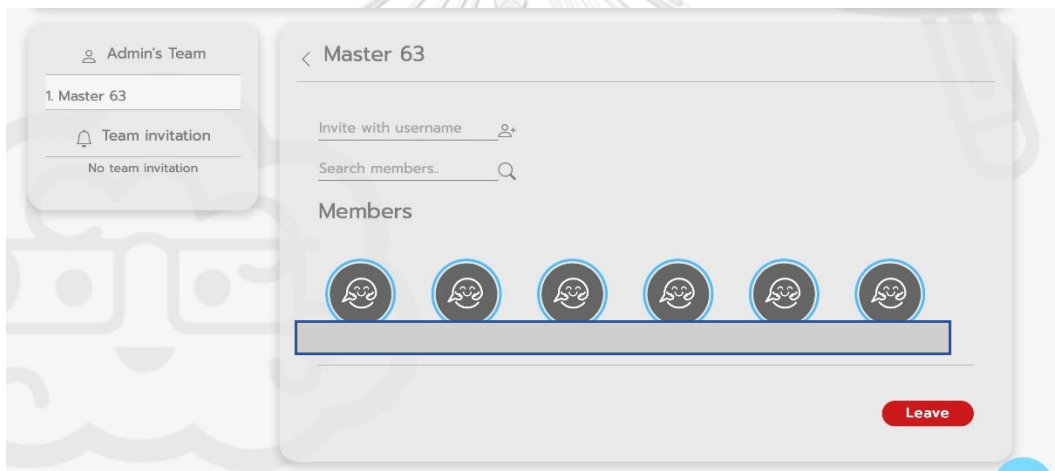
This screenshot provides a closer look at the Master 63 team view:

- Navigation:** Dashboard, Sharing & Empathy, Team, Review, admin01.
- Team: Master 63:** A detailed calendar view for the month of October 2021. The days are color-coded by emotion: green for "Excited" and yellow for "Pleased". The current month shows a high frequency of green days.
- Your Current Emotion:** A panel showing a green smiley face icon and the word "Excited".
- Master 63's Empathy board:** A chat interface showing messages from "Wittayanon" (with a yellow smiley face) and "Phiphat thabjaroen".
- Bottom Right:** A blue circular button with a white plus sign (+).

Empathy Board



Group Tool



Dashboard

← Myself →

Admin 01

	current	days	weeks	months																					
Today	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	
15/4/2022																									
14/4/2022																									
13/4/2022																									
12/4/2022																									

My Feeling

with Communication
admin01 2021-10-07, 8:32:24 PM

Excited

with Discussion
Admin01 2021-09-24, 12:26:33 PM

Pleased

← Team →

Master 63

Master 63 ▾

	current	days	weeks	months				
		Mon	Tue	Weed	Thu	Fri	Sat	Sun
This week								
1week ago								
2weeks ago								

by group by member

My Feeling

with Communication
admin01 2021-10-07, 8:32:24 PM















Excited

with Discussion
Admin01 2021-09-24, 12:26:33 PM





Pleased

Emotion Reflection


How would you describe you feeling?*

 Pleased	 Glad	 Excited	 Amused
 Satisfied	 Relaxed	 Sleepy	 Tired
 Alarmed	 Afraid	 Angry	 Sad
 Bored	 Gloomy		


What have you been up to?*


 Individual	 Social	 Mental	 Achievement
Talking	Discussion	Meeting	
Brainstorming	Concept Mapping	Seeking/help	
Support	Negotiation		

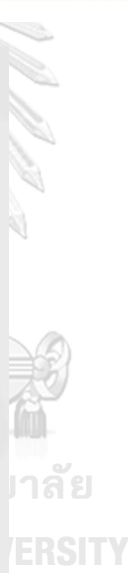
I just want to say... 

 Good Afternoon
Admin :)
Admin,Support

Your Current Emotion


Excited





Collaborative Note-Taking via Google Document

January 10, 6:35 PM

คำชี้แจง


กิจกรรมการสัมมนาระดับบัณฑิต ภาควิชาเทคโนโลยีและสื่อสารการศึกษา
ในการจัดตารางปฏิบัติงานของกลุ่มในรูปแบบออนไลน์ 100%
(ทำงานร่วมกันบนแพลตฟอร์ม Sociemo และ Google Docs)

ระยะเวลาการจัดกิจกรรม: 12 สัปดาห์ (13 กันยายน -3 ธันวาคม 2564)
 หรือ 5 ชั่วโมงต่อสัปดาห์ รวมระยะเวลา 60 ชั่วโมง

คำอธิบาย: แผนปฏิบัติงานนี้เป็นการกำหนดเป้าหมายร่วมกันของกลุ่ม
 เพื่อให้สมาชิกของกลุ่มสามารถวางแผนจัดทำโครงร่างวิทยานิพนธ์รายบุคคล*
 สำเร็จลุล่วงไปได้ด้วยดี ให้นิสิตร่วมกันอัปเดตแผนการปฏิบัติงานให้เป็นปัจจุบัน

*แผนการปฏิบัติงานนี้เป็นหนึ่งในการกำกับตนเองร่วมกัน (Socially-Shared Regulation) ของกลุ่ม
 จึงไม่รวมถึงแผนการทำงานรายบุคคล

** โปรดอัปเดตไฟล์นี้ภายในสัปดาห์สุดท้ายของทุกเดือน (31 สิงหาคม, 30 กันยายน, 30 ตุลาคม)
สมาชิกในกลุ่ม



Version history

All versions

JANUARY



- ▶ January 10, 6:35 PM
 - Current version
 - Teerawat Chanopad
- ▶ J...
- ▶ J...
- OCTO...
- ▶ O...
- ▶ O...
- SEPT...

แผนการปฏิบัติงาน ☆ 📄 ⓘ 🌐

View Tools Help

👁 ↗ 💬 Share

	รูปแบบของการเรียนรู้	ออนไลน์ประสานเวลา (Online Synchronous)	ออนไลน์ไม่ประสานเวลา (Online Asynchronous)
o the document will	70% การเรียนรู้จากประสบการณ์	เรียนรู้จากการฟังเพื่อนในรุ่นสอบ โครงร่างวิทยานิพนธ์ ทำให้ได้เตรียมตัวและแก้ไขงานตนเองเพิ่มเติม เรียนรู้การเก็บรวบรวมข้อมูลจากวิชา DATA COLLECTION นำมาใช้กับงานวิจัย	การสังเคราะห์เอกสารทำให้เกิดประสบการณ์ในการคัดเลือกเอกสารและมองตัวแปรต่างๆ พัฒนาโครงร่างวิทยานิพนธ์อย่างต่อเนื่องตามตัวแปรที่ตั้งใจศึกษา
	20 % การเรียนรู้ทางสังคม	ได้แลกเปลี่ยนเรียนรู้กับเพื่อนที่ทำรูปแบบการวิจัยเหมือนกัน วิธีการคัดเลือกตัวแปรหรือองค์ประกอบที่เกี่ยวข้องกับตัวแปร การประชุมกลุ่มร่วมกับสมาชิกในกลุ่มและอาจารย์ที่ปรึกษา	แลกเปลี่ยนกับเพื่อนๆ สาขาอื่นที่เรียนด้วยกันทาง Chat
	10% การเรียนรู้แบบเป็นทางการ	อบรมความรู้เรื่องการทำอ้างอิงด้วย Endnote	

วันที่	ช่องทาง	หัวข้อ/เรื่อง	หมายเหตุ
13 กันยายน	zoom	หัวข้อวิทยานิพนธ์ที่สนใจ	
20 กันยายน	zoom	ตัวแปรและกรอบแนวคิด	
4 ตุลาคม	zoom	โครงร่างวิทยานิพนธ์ (บทที่1)	
7 ตุลาคม	zoom	วางแผนเป้าหมายในการพัฒนาโครงร่าง	



การสะท้อนคิดและการประเมินการทำงานของกลุ่ม: หลังดำเนินกิจกรรม (7 และ 10 มกราคม)

- สิ่งที่ได้เรียนรู้จากกลุ่ม
เมื่อมีการวางแผนระยะเวลาในการทำงานร่วมกันอย่างชัดเจน ทำให้สมาชิกกลุ่มช่วยเหลือกัน และสามารถสอบ โครงร่างวิทยานิพนธ์ได้ตามเวลา
- การเปลี่ยนแปลงที่กลุ่มสามารถทำได้เพื่อปรับปรุงประสิทธิภาพ
มีการนัดหมายปรึกษางานกับอาจารย์ที่ปรึกษาวิทยานิพนธ์อยู่เป็นระยะ ทำให้สามารถทำงานเสร็จได้ตามเวลามากขึ้น
- ในกลุ่มของเรา เราทำได้ดีมากในเรื่อง
จับกลุ่มหรือจับคู่ช่วยกันเขียนเล่มวิทยานิพนธ์ ทำให้มีการปรึกษาและคอยกระตุ้นกัน ให้มีความก้าวหน้าในการทำงาน
- เป้าหมายของเรา ในครั้งต่อไปคือ
สอบ โครงร่างวิทยานิพนธ์/ทำเครื่องมือและนำไปทดลองตามที่ได้วางแผนไว้
- ขั้นตอนที่เราต้องดำเนินการเพื่อให้บรรลุเป้าหมายคือ
ดำเนินการทำเครื่องมือวิจัยเพื่อให้ผู้เชี่ยวชาญตรวจสอบคุณภาพเครื่องมือ
- ทรัพยากร (ใครและอะไร) ที่เราต้องการเพื่อให้บรรลุเป้าหมายคือ
คำแนะนำจากอาจารย์ที่ปรึกษา เวลาที่ใช้ในการทำวิทยานิพนธ์ เปเปอร์

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