THE DEVELOPMENT OF A CONSTRUCTIVIST INSTRUCTIONAL MODEL USING SELF-DIRECTED AND ISSUE-BASED LEARNING TO EMPOWER SKILLS FOR EDUCATION FOR SUSTAINABLE DEVELOPMENT IN BUSINESS STUDIES FOR INTERNATIONAL HIGH SCHOOL STUDENTS IN THAILAND

By

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A Thesis Submitted in Partial Fulfillment of the Requirements

for Doctor of Philosophy CURRICULUM AND INSTRUCTION

Department of Curriculum and Instruction

Graduate School, Silpakorn University

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MISS PIYAWAN SUNASUAN : THE DEVELOPMENT OF A CONSTRUCTIVIST INSTRUCTIONAL MODEL USING SELF-DIRECTED AND ISSUE-BASED LEARNING TO EMPOWER SKILLS FOR EDUCATION FOR SUSTAINABLE DEVELOPMENT IN BUSINESS STUDIES FOR INTERNATIONAL HIGH SCHOOL STUDENTS IN THAILAND THESIS ADVISOR : ASSISTANT PROFESSOR UBONWAN SONGSERM, Ph.D.

The purposes of the research were 1) to study and develop a constructivist instructional model using self-directed and issue-based learning to empower skills for education for sustainable development in business studies for international high school students in Thailand 2) to study the effectiveness of using the instructional model and the level of skills. The target audience was 24 12th-grade students at Mahidol University International Demonstration School for the academic year 2021. The research tools were the model, manual, unit plans, and skills for ESD evaluation form. The statistics used in the research were mean and standard deviation in conjunction with content analysis. The results were as follows: 1. The constructivist instructional model using self-directed and issue-based learning to empower skills for education for sustainable development in business studies for international high school students in Thailand called “EDIIIS” consisted of five elements. There are 1) principle - the instructional model is designed to empower students’ sustainable learning skills which they take important roles in self-direction in learning to change perspectives and behavior with intentions to solve the issues related to challenges and dilemmas of sustainable development goals. 2) objective is to empower skills for ESD in business studies for international high school students in Thailand. 3) the learning processes consist of six steps (1) Explore the issues: E (2) Diagnose learning needs: D (3) Identify objectives: I (4) Identify the learning task and plan: I (5) Implement the plan and monitor the process: I, and (6) Summarize and evaluate the results: S. 4) Measurement and evaluation are skills for ESD (1) Self-awareness (2) Systems thinking (3) Critical thinking (4) Integrated problem-solving (5) Collaboration 5) Conditions (1) The issues must be relevant to students’ context and can influence the students to think more and (2) Students should have at least basic language function skills or an intermediate level of English proficiency. 2. The effectiveness of using the instructional model to empower skills for education for sustainable development revealed that the overall skill level was at the Relational level 2.1) The self-awareness was at the Relational level 2.2) systematic thinking was at the Relational level 2.3) critical thinking was at the Relational level 2.4) integrated problem-solving was at the level of Extended Abstract and 2.5 collaboration was at the level of Extended Abstract.

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Chapter 1

Introduction

1.1.Statements and significance of the problems

The 2030 Agenda for Sustainable Development in the vision for Transforming our world, adopted at the United Nations Sustainable Development Summit on 25 September 2015, represents the necessity of incorporating Education for Sustainable Development (ESD) principles into all levels of education (Cebrián, Junyent, & Mulà, 2021; UN, 2015). ESD refers to the lifelong learning of learners who respond to current statements involving the global evolution of three major areas: social, economic, and environmental issues (McKeown, 2002; Raufflet et al., 2009; UNESCO, 1997, 2012, 2017). It promotes positive change by assisting students in developing a perception of social equity and consciousness as community members (UNESCO, 2012a). ts purpose is to help students develop critical thinking and reflection abilities in order for them to respond in complicated sustainability issues. ESD takes a comprehensive approach to connecting personal thinking skills, decision-making skills, and participatory skills, which motivates behavioral changes. It is essential for oneself as well as the larger community (Badea, Ș erban-Oprescu, Dedu, & Piroș că, 2020; Nieboer, 2018a). To put it simply, ESD is education that aims to achieve sustainable development (Taimur & Sattar, 2019).

Since 1997, UNESCO has promoted the development and implementation of the ESD. The conference emphasized the transformation of the new vision toward the role of education and public awareness. Sustainable development was established as a long-term goal in which education is intended to change individual behavior and lifestyle. Individuals and the general public are expected to be better prepared for the transition to globalization through knowledge dissemination and skill development (UNESCO, 2017).

It urged all nations to recognize the importance of ESD to achieve sustainability goals. It was addressed that education reconstruction should be made mandatory because it provides genuine long-term learning opportunities in the modern world as "quality education." In recent years, the emphasis on skill development has increased while the content-based focus has slightly declined in educational trends. Learners are expected to improve their learning progress rather than simply passively receiving content from instructors. However, ESD is still a new approach in the world of education (Vilmala, Karniawati, Suhandi, Permanasari, & Khumalo, 2022). In addition, secondary education has seen less implementation to empower sustainability competencies than higher education settings (Cebrián et al., 2021).

From traditional teaching pedagogies to new instructional methods, it is undeniable that education has tended to place a greater emphasis on the development of learners for long-term development rather than memorizing to achieve high academic results. The traditional methods were previously the dominant method in the field of learning which enable teachers to assess students' abilities based on their knowledge acquisition competencies from various contents and materials provided by their teachers (Khalaf, 2018; Luther, 2000). These antiquated pedagogies only serve students' lower-order thinking, which impedes their progress in learning because passive learning focuses on a single point of view by their teachers as authorities. Luther proposed that the key ideas for implementing the new teaching methods are the need for higher-order thinking and respect for the diversity of learners. Thus, higher-order thinking has been highly encouraged in classrooms around the world for several years.

Higher-order thinking, or higher-order cognition, is defined by Glatthorn, Boschee, and Whitehead (2009) as the comprehensive understanding of ability and implementation to solve problems and generate new ideas creatively. Interdisciplinary learning is required to create "meaningful learning" following the UNESCO learning module for sustainability (Cox, Fien, & White, 2010). According to the module, integrated

problem-solving from various perspectives will discrete learners' long-term knowledge. Since then, ESD pedagogies in both primary and secondary schools have shifted slightly from teacher-centered to student-centered instruction (UNESCO, 2012a).

Laurie, Nonoyama-Tarumi, Mckeown, and Hopkins (2016) investigated the implementation of ESD in education in 18 countries, which aided in a better understanding of the ESD. They proposed that ESD leads to higher-quality education, which raises students' academic performance scores. Although no obvious link could be found, the researchers discovered that ESD had a significant impact on the learners' ability to improve their higher-order thinking skills. This is evidence that the process has aided in preparing students for various job markets. Some saw the ESD as part of a larger process of developing great people.

According to Laurie et al. (2016), one critical question in the study is whether the ESD can guide students to have sufficient skills in sustainable development. According to the findings, ESD helps students develop both as individuals and as global citizens in their interactions with others. As a result, it was proposed that a collaboration between the government and teachers be undertaken, with a focus on the implementation of ESD policy and the professional development of teachers. To encourage and support ESD in the curriculum and instruction, schools should also adopt ESD management practices. In addition, ESD should be fully integrated into secondary school curricula (the study also mentions the primary school level).

Despite learning content meaningfully, today’s pedagogical approaches should acquire the skills and knowledge in the notion of sustainable development to pull society toward a better future (Martín-Garin et al., 2021). To achieve the ESD goals, UNESCO addresses that educators should work on 4 major themes (esd.bgk, 2019).

1) Learning content: Incorporate critical issues such as “climate change, sustainable consumption and production (SCP), disaster risk reduction (DRR), and biodiversity” into the curriculum's content.
2) Pedagogy and learning environments: emphasize active, student-centered learning to encourage learners to explore, act, and think for sustainability.
3) Societal transformation: raise students' awareness of the global citizen concept, in which they should act and engage in any local and global challenges to transform themselves and the society in which they live.
4) Learning outcomes: promote core learning abilities such as systemic thinking, critical thinking, participatory decision-making, and collaboration to stimulate learning and meet the ESD.

The goal of ESD is to prepare students for a changing world and to enable them to shape sustainable development (Rieckmann, 2018). The role is to promote knowledge and competencies that will assist students in achieving long-term development goals (UNESCO, 2017) . Its concept combines approaches from development education, environmental education, political education, peace education, and other fields. As a result, the goal is to make the complex interrelationships easier to understand when the priorities are considered separately. As a result, the ESD concept no longer focuses solely on a single perspective and attitude, but rather on presenting various solutions and positions to problems (Rieckmann, 2018).

The competencies will encourage students' ethical behavior (moral criteria) and their desire to participate in public decision-making and society. Following that, increased participation will result in more options for solving a problem in the context of long-term development goals. Students will be able to fulfill a need that is important to them in the long run by not harming nature or others in society (Nieboer, 2018b).

Isenmann, Landwehr-Zloch, and Zinn (2019) investigated the integration of ESD into higher education curricula. They discovered the morphological box for ESD in 14 criteria, which can be synthesized into three groups: social competence, professional competencies (skills and knowledge), and self-reliance. They were constructed to advance the higher education program in mind. Personal competence embedded in social competence should be built as a foundation at the most basic level. It is advised to concentrate on "know-how" knowledge.

The ESD concept is now focusing on stimulating a person's learning process to solve problems. The goal of ESD is to allow students to participate in long-term planning. Education has primarily focused on the future. However, it now intends to emphasize on an individual's future. It is about assisting students in understanding the interrelationships between socio-cultural, economic, and ecological structures as well as in contributing to their resolution (Scherak & Rieckmann, 2020). These demonstrate the significance of ESD and why it is regarded as an important goal for learners in the twenty-first century. The ESD not only facilitates knowledge acquisition but also emphasizes the long-term enhancement of skills and is directly link to quality education.

When the International Forum on Education for Sustainable Development (ESD) was held in Thailand in 2017, M.L. Panadda Diskul, the incumbent Deputy Minister of Education, spoke about the importance of ESD in Thailand, focusing on Professional and Learning Development for ESD. He stated that the government has decided to set a vision and strategies for the ESD orientation to empower Thai teachers and learners to meet global expectations (Education, 2017). As a result, international schools in Thailand that are focused on raising learning objectives to meet international standards should implement the ESD goal to foster better global citizenship. According to Bangkokbiznews (2019), the number of international schools in Thailand is increasing by 12 percent each year. This reflects Thai society's increased need for emerging globalization.

As ESD has become the primary focus of global learners' education, international schools in Thailand should develop expected school-wide learner outcomes (ESLOs) to meet global expectations, particularly at the secondary level. International high school students should be pushed to develop their own sustainable learning instructional systems and to prepare for a larger role in society.

Mahidol University International Demonstration School (MUIDS) is founded in 2013. The school was initially introduced as a place where students could experiment with new ways of learning through a variety of project-based learning and creative educational methods. Its primary goal is to provide students with practical experiences that will enable a sustainable life-long learning environment in the classroom. These are reflected in the expected school-wide learner outcomes (ESLOs), which emphasize six key skills to prepare students for the twenty-first century as follows.

1) Strategic learners

Students recognize their worth and can set personal goals based on what is important to them. They are encouraged to think strategically about their learning and to develop a development plan based on self-assessment.

2) Innovative thinking

Students' multidisciplinarity fosters strong connections in the integration of subjects, which leads to innovation. Students' goals are to gain proficiency in a class so that they can connect with others while also innovating new ideas and developing intellectual curiosity.

3) Articulate speaking

The four communication skills are developed through various activities in class and outside of class. The goal of having students practice communication in a variety of situations is to prepare them to interpret complex ideas with deep and meaningful understanding. The students use technology to learn and can then explain their ideas to different groups in ethical ways among cultural diversity.

4) Morally intelligent

Various perspectives are expected to be gained through class discussions and activities to develop a morally intelligent individual. The school community encourages students to demonstrate empathy by increasing their awareness of others and acting appropriately in all situations.

5) Global citizens

Understanding cultural diversity and gaining a global perspective is the primary goal of preparing students for the twenty-first century. Students are taught to suspend judgment and to be respectful of people from all walks of life.

6) Future leadership

Students are expected to lead in a variety of situations using appropriate leadership styles as future leaders. Participating in universal activities such as managerial skills, decision making, and persuading others helps to develop major leadership skills.

According to the goals, MUIDS is attempting to develop students as assets to the global community. The ESLOs have a strong connection to the ESD goals, which focus on developing "knowledge," "skills," and "perspectives" that include both individual values and interrelationship perspectives to the local community and global connections. The benefits of incorporating ESD into school instruction are seen to have a direct impact on learners' long-term benefits. It improves the individual quality of life and, as a result, improves educational quality.

More than 30 MUIDS teachers discussed current issues and higher level-learning building ideas at the MUIDS professional development workshop on English language learners on September 4th, 2019, and on October 9th, 2019, to clarify the above statements generally for all students in MUIDS from various subject teachers. According to Bloom's taxonomy, the ideas are generated from general data about each class's common learning activities, which are classified into three lower-order thinking

levels (Bloom, Engelhart, & Furst, 1956). Then, have all teachers discuss and share their ideas on how to develop the activities so that they are in the top three higher-order thinking levels. This discussion aims to identify potential additional modifications not only for specific classes but also for overall strategies that teachers discovered to be beneficial to several types of learning activities.

From the workshop's discussion, there are several traps or misconceptions that teachers might fall into when trying to reach higher learning levels.

1) The first is word usage. For example, a teacher tells students to "analyze" a graph or a book or something and assumes that the assignment reaches the higher learning levels as there is the word "analyze" that appears on the question based on Bloom's taxonomy chart. Unfortunately, students usually only give us a description of the graph, book, or character. This only reaches the understanding level.
2) Another trap is that we feel because we use a certain technique such as close reading or a 3-2-1 reflection, that those upper levels are automatically reached.
3) A third trap is an application, where the teacher has students solve a problem in the real world that they have never seen before and called this analysis. This only reaches the application level. The key determination as to whether a teacher is reaching the upper levels of learning is what the student turns in. Certain techniques, activities, supports, situations, and directions can assist in reaching higher levels of learning, but they do not automatically equate to higher learning.

These findings indicate that a significant proportion of ESL (English as a second language) learners struggle with language learning, preventing them from progressing to higher-order thinking processes. Many students come from diverse backgrounds and have varying levels of education. Some courses, such as Business Studies, are new to students, and they have less background knowledge. Self-learning and the selection of

learning resources are effective methods for overcoming obstacles. As previously stated, the link between higher-order thinking, particularly critical thinking, and sustainable development is explicit. Higher-order thinking is a cognitive process that is used to its full potential. Effective pedagogies for empowering learners, particularly ESL learners, should take into account techniques that improve students' comprehensive understanding and allow for higher-order thinking. Differentiation of learners should be emphasized in instructional methods. Furthermore, learner orientation approaches that motivate learners to direct their learning process and long-term learning are required.

It is supported by research from Moungpluan (2010) who discovered that teachers not only lack effective instructional methods to motivate learners to learn but also prevent students from truly understanding the content by relying on context clues. It prevents students from using language to gain additional knowledge in areas of interest that they can apply to sustainable development. Mavoa (2014) also claims that many students continue to rely heavily on their teachers' goals and objectives and that they lack intrinsic motivation, which impedes their long-term development. The growing emphasis on ESD encourages schools around the world to develop their instructional systems to meet the needs of sustainable development.

Despite the lack of a nationally mandated curriculum in the country, various teachers reported shortcomings and weaknesses in current ESD pedagogies to integrate into traditional lessons (Pihen González, Iyengar, & Kwauk, 2021).

ESD necessitates "participatory teaching and learning methods that motivate and empower students to change their behavior and take action for sustainable development," according to UNESCO (Badea et al., 2020). There are two approaches to ESD, which result in different learning outcomes (Vare & Scott, 2017; Disterheft, Caeiro, Azeiteiro, and Leal Filho, 2013: cited in Hajdukiewicz & Pera, 2020). There are two perspectives on student empowerment: 1) learning approaches to building student

empowerment, which focuses on independent critical thinking skills, and 2) behavior modification, which aims to change students' sustainable behaviors.

Various teaching pedagogies improve skills in sustainable development. ESD pedagogies are mostly issue-based or place-based learning, according to UNESCO (2012a: 15). These instructional methods promote critical thinking, context analysis, and social critique. They enable students to debate, analyze, and apply values. The activities should encourage creativity and the exploration of alternative futures. As community members, students should be encouraged to positively change and develop self-efficacy, as well as a sense of social justice.

Problem-based learning (PBL) or issue-based learning (IBL) is a student-centered approach that begins with a problem or issue. Both terms refer to the same ideas and methods. The term 'problem-based learning' is frequently used in various papers because it encompasses a wide range of ideologies. However, in this study, the researcher would use the term "issue-based" to address the link with ESD because it demonstrates the researcher's concern with primarily sustainable development issues rather than an overall problem. It addresses how students learn to learn so that they can solve problems that are meaningful and important to them. It is concerned with knowledge, knowledge acquisition, and knowledge application, as well as long-term knowledge retention (Goh & Yew, 2016; Van Den Bossche, Segers, Gijbels, & Dochy, 2002). It enables students to motivate and explore their learning through real-life issues that are important to them. Higher-order thinking, including reflective thinking, is promoted through an active and participatory approach among various learners and perspectives through effective collaboration (Khanthasiri et al., 2015; Prasertsuk, 2016; Pyykkönen & Kalliomaa, 2013; Ramsiri, 2013a). It is a highly effective method for facilitating deep and transformative student learning. It enables students to address real-world sustainability issues in their community (Bessant et al., 2013).

> *"PBL is an ideal approach for sustainability and related issues and that exceptional PBL scenarios can be designed which really engage the students at every level of study."(Bessant et al., 2013).*

Corvers, Wiek, de Kraker, Lang, and Martens (2016) studied the role of problem-based and project-based learning models in sustainable development. They discovered a link between the learning approaches and the concept of ESD. The approaches encourage student-centered learning environments, particularly the use of real-world issues in education. The model takes into account four learning principles: constructive learning, collaborative learning, contextual learning, and self-directed learning (Dolmans & Schmidt, 2010: cited in Corvers et al., 2016).

Khandakar et al. (2020) investigated the Multi-Course PBL Approach's impact on Education for Sustainable Development. The research focuses on the impact of two interdisciplinary Electrical Engineering (EE) undergraduate courses at Qatar University. It aimed to promote critical thinking and collaborative decision-making skills in ESD. The course employs problems as tools for acquiring required knowledge, as well as self-directed learning to acquire new knowledge. The survey was designed to gather feedback from students. It revealed that students' average marks in design projects had increased. Students in the courses reported that the approach helps them to improve their creative thinking skills so that they can apply what they've learned in the classroom to real-world situations. Students also argued that it promotes self-learning.

Problem-based learning has also been discovered to be widely used in business studies, with significant effects on business knowledge, knowledge acquisition, and knowledge application (Van Den Bossche, Regers, Gijbels, & Dochy, 2002). However, Corvers et al. (2016) asserted that effectively implementing PBL to embrace all of the principles remains a significant challenge due to differences in students' prior

knowledge, the ability to apply theoretical concepts to practical terms, and the roles of teachers, students, and stakeholders in the learning process.

Many researchers have discovered the positive implications of using a self-directed learning approach to promote ESD to enable an individual's empowerment approach (Lander, 2010; Lubbe, 2015a; Nerali, Telang, Telang, & Chakravarthy, 2016).

Edward C. Linderman (1925: cited in Mavoa, 2014), an American educator, introduces the concept of self-directed learning (SDL), arguing that learners, particularly adults, learn best through SDL. It refers to their motivational learning in which they discovered their interests and needs in their life. The SDL is effective not only when students learn individually.

Lander (2010) probed the use of self-directed learning to promote sustainability in the classroom. He discovered a strong link between SDL and the transformative learning goal. He emphasizes that ESD must include a variety of disciplines that are experiential, collaborative, and potentially transformative. Regardless of the problem-based learning approach, a learning approach to transform thinking is required. SDL can encourage students to learn critically so that they can evaluate their contextual knowledge and develop personal goals that are aligned with social goals (Hammond, and Collins, 1991: cited in Lander, 2010)

Lubbe (2015a) implemented the cooperative-based group in a self-directed process and claims that it improved the learner's essential skills “such as taking initiative and being motivated to learn, taking responsibility providing and receiving help from others, knowing to use peers as resources, and developing strong social skills.” In line with Anuphap (2017), who investigated the use of SDL for learning development in his computer class and concluded that self-directed learning has enabled learners to successfully learn and better understand themselves. There is evidence that SDL is associated with the development of long-term learning skills.

According to Nerali, Telang, Telang, and Chakravarthy (2016), SDL is a key component of the Problem-based approach that meets the goals of lifelong learners today. Learners, according to SDL, are in charge of planning, monitoring, and evaluating their learning. The emphasis on SDL may be a defining aspect of the PBL process as learners discuss and develop strategies to address knowledge gaps while reflecting on their own and their group's progress. As a result, learners are motivated and aware of their prior knowledge to act on their learning, which is an important skill in long-term learning. According to research, some aspects of PBL appear to help with the development of SDL. Students would generate the learning goal by identifying their learning gaps before receiving other curriculum inputs in the PBL process while working on diagnosing issues. Applying new information to an issue and learning to reflect collectively as a group are all significant features that enhance SDL and improve students' academic success.

The constructivist approach is effective for empowering learners' metacognitive and self-directed learning (Gazi, 2009). It encourages students to take charge of their learning and boosts motivation. Furthermore, it improves some skills such as critical thinking, problem-solving, creativity, and knowledge construction. The constructivist view of learning also encourages student differentiation based on prior experiences and knowledge (Maxwell, 1995). Constructivist learning is an adaptive and active process that aims for comprehensive understanding. Learners have control over the learning process and can deeply integrate learning and context (Brooks & Brooks, 1993; Wanniarachchi, 2016).

Nieboer (2018a) contends that constructivism, particularly social-constructivism, is best suited to ESD. Constructivism is a learning theory that focuses on how people gather and construct knowledge to learn new things. The knowledge construction that results from social interaction also corresponds to the concept of the social-

constructivism learning process. It enables students to learn from real-world problems and apply their knowledge, skills, and attitudes.

To summarize, an issue-based approach is typically used to empower ESD in students by encouraging social and professional skills. However, promoting self-reliance is a significant challenge due to differences in students' prior knowledge and application to real-life situations, in addition to the roles of teachers, students, and stakeholders in the learning experience. Thus, the researcher's goal is to create a constructivist instructional model that combines self-directed learning with issue-based learning, so that the model can support both social competencies and self-reliance while also meeting the needs of individuals and people from different backgrounds.

This is supported by a study of MUIDS student backgrounds (SCHOOL, 2021), which reveals that students came from various programs, raising the possibility that students may lack self-direction because some students learned to rely on their teachers. It is suggested that more emphasis be placed on student-centered and SDL in the classroom.

As previously stated, there is little evidence of effective pedagogies to address ESD, particularly in secondary education, because the emphasis is primarily on higher education (Cebrián et al., 2021). Most ESD concepts are centered on equipping youth or young adults with essential practical skills that will allow them to live sustainable life as effective adults. According to the study, learners at a young age pay close attention to empowerment because they are on the verge of becoming adults and have the potential to be more aware of real-world issues that are important to them and society. Furthermore, due to the researcher's findings on readiness, background, and needs, current pedagogy may not be effective in empowering ESD skills among international high school students. The issue-based approach may allow students to better practice their ESD skills. However, students' readiness to initiate their learning progress and

explore issues requires a high level of self-direction. Thus, the researcher focuses in this study on developing a new constructivist instructional model using self-directed and issue-based learning to empower ESD skills in high school international students in Thailand who will become effective global citizens in the future.

The following parts of the research will focus on the development of a constructivist instructional model using self-directed learning and issue-based learning to empower skills for education for sustainable development in Business Studies for international high school students in Thailand.

1.2.Conceptual Framework

The Research and Development of Instructional Design Model

The research and development method is primarily used because it aims to innovate a new approach to developing researchers' specific goals. In this study, innovation is defined as a constructivist instructional model that combines self-directed and issue-based learning approaches. The innovation's desired outcome is to empower ESD skills for business studies students who are English second language (ESL) learners at an international high school in Thailand. The research and development methodology is divided into four steps: research (R1), development (D1), research (R2), and development (D2) (Nillapun, 2015).

Research (R1): Firstly, the research of needs and related factors should be done to investigate and identify the essential factors that affect the development in the second process.

Development (D1): Secondly, the researcher designs an effective instructional model to meet the needs of the first process.

Research (R2): Thirdly, the model is implemented in the real classroom by the researcher to confirm its effectiveness.

Development (D2): Finally, the researcher evaluates the outcomes to consider whether it needs to be modified or can use to disseminate to others.

As a single data source may be insufficient, mixed methods research can assist researchers in understanding several aspects of the study's focus (Creswell & Plano, 2018). In research development, the mixed-methods design is used. In the interpretation phase, both qualitative and quantitative findings are analyzed and evaluated.

Instructional Model concept

The instructional model denotes the methodical nature of teaching and learning. Some elements from the principles, theories, and concepts have been studied to organize them into a step-by-step process. It is effective and can be used to achieve a specific pattern goal (Joyce, Weil, & Calhoun, 2015; Khammanee, 2018; Sirithanyarat & Laoriendee, 2019).

The instructional design is following the ADDIE model. Kruse created it in 1970 as an instructional system design model. It is widely used in many fields because the model provides a step-by-step approach that aims to meet the needs of the target audience (Balanyk, 2017; Kruse, 2009). A model is a five-phase interactive approach that works together to achieve the desired goal.

1) Analysis: The researcher studies and collect data including needs, gaps, and importance to use as a framework to develop a model
2) Design: The model and tools to be used with the model including manual, tools, or other documents are designed
3) Development: The model and all materials are created

4) Implementation: The materials are implanted in a sample group or target to meet the output.
5) Evaluation: The effectiveness of the model and materials are evaluated after the complete implementation

The model consists of

1) principle
2) objective
3) processes
4) measurement and evaluation
5) conditions.

Constructivist Learning Theory

Constructivism is a learning theory that relates to a learner's developmental learning process of constructing knowledge from his or her experience, social and cultural context, as well as new ideas or concepts that they come into contact with. It entails the cognitive process of learners actively learning with the help of their context. As a result, the constructed knowledge would be meaningful and would be based on truths and relevant experiences. Using constructivism in instructional design necessitates the development of an effective plan, as well as guidance and support materials such as various cases or examples, tasks that allow students to improve higher-order thinking, and a variety of activities. Furthermore, the teacher would be an important person in facilitating and encouraging students throughout their learning progress, as well as serving as a learning model for them. Students should be encouraged to discuss, exchange, and receive various ideas from various viewpoints, perspectives, and examples to enhance their learning together by bringing their prior knowledge or experience to be accommodated in the construction of new knowledge (Clark, 2009; Kapur, 2019; Ramsiri, 2013a; Richardson, 2003; Tobias & Duffy, 2009).

Self-directed learning

Adult growth requires self-directed learning, which is a precondition for life-long learning (M. Knowles, 1975). It is a learning approach in which people direct their learning paths from the beginning to the end, and teachers serve as facilitators by providing useful feedback as guides (Brockett & Hiemstra, 1991; Brookfield, 2009; M. Knowles, 1975). According to Brookfield (2009), self-directed learning can work in two ways: as an internal change process and as an instructional process that is dependent on the learners. They operate in a manner that is similar but not identical.

By going over twenty-three major definitions of self-directed learning dating back to 1960 and the most recent proposed in 2000. It has been discovered that the slight shifts in SDL definitions and concomitant paradigm, which fall into three major dimensions; learning environment, personal attributes, and cognitive/ psychological process, are still embedded in the newer one respectively. These depict the characteristics of SDL learning, which are divided into three categories: person, process, and context. (Brockett & Hiemstra, 1991; Ma, 2017b).

However, this is not to say that self-directed learning is just beneficial to people. Cooperative and collaborative learning can also be adapted to meet the needs of the learner. (Brookfield, 2009; Grow, 1991, 1996; Lubbe, 2015a). Self-directed learning is comprised of five major processes, which are as follows.

1) Diagnose learning needs
2) Identify objectives
3) Plan learning activities
4) Implement and monitor the process
5) Evaluate and reflect on learning

Then it works indefinitely toward a new starting point (Ma, 2017b).

Issue-Based Learning

In ESD and business education, issue-based learning (PBL) or problem-based learning (PBL) is frequently used. PBL is commonly referred to as a student-centered approach in adult education that focuses on knowledge, knowledge acquisition, and knowledge application, as well as long-term knowledge retention (Goh & Yew, 2016; Van Den Bossche, Segers, et al., 2002). The researcher has organized the process of issue-based learning into six steps, which are as follows (Khanthasiri et al., 2015; Prasertsuk, 2016; Pyykkönen & Kalliomaa, 2013; Ramsiri, 2013a).

1) Explore and prioritize the issues
2) Understand the problem
3) Identify the learning tasks and plans
4) Implement the plan and learn
5) Summarize and present the solution
6) Evaluate results

Education for Sustainable Development (ESD)

Since UNESCO declared ESD to be a significant global goal, numerous studies on ESD have been conducted. Education for sustainable development refers to the lifelong learning of learners who respond to current statements involving the global evolution of three major areas, namely social, economic, and environmental issues (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017).

Thus, ESD principles aim to develop both intrinsically and extrinsically. Individual mindset, wisdom, and behavior are thought to be developed by the learners. Payutto (2018) responds to global sustainability needs. He claims that the three learner skills, as well as the four areas of human beings, society, nature, and technology, should be developed. As a result, they improve both the quality of education and the quality of life.

They also ensure a long-term future. As a result, the goals of education for sustainable development imply that stakeholders collaborate to meet the needs of the government, community, school administrators, teachers, and even students.

The researcher is focusing on the outcomes of learners in this study to determine what skills learners should have to meet the Sustainable Development Goals. The researcher discovered the following five ESD skills.

1. **Self-awareness**

Self-awareness is the third of four levels of consciousness (Morin, 2011). It demonstrates higher reflective thought than consciousness and is relevant to self-awareness by itself or by others. In ESD, self-awareness refers to the ability to be aware of one's abilities, strengths, weaknesses, and limitations, as well as to set and achieve goals and plans. It also encourages a person to consider the presence of self and one's role in the community and globally.

This would assist the individual in driving the values that he or she wishes to develop sustainably (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). This refers to an individual's self-commitment as well as an awareness of community value (Payutto, 2018).

Self-awareness in ESD refers to the ability to:

1) Be aware of one's need by reflecting on his/her role in society
2) Create a clear and valuable vision, and plan for the future
3) Move from awareness to knowledge to action.
4) Evaluate and assess the consequences of actions to deal with conflicts and changes

To assess self-awareness, the tool should focus on making an individual aware of their statements, reflective thoughts toward self-relevant to sustainable goals, and evaluating self to set goal process so that they can fully commit to their goal with motivation (Ashley & Reiter-Palmon, 2012; Clawson, Kotter, Faux, & Mcarthur, 1985; Zaffiro, Tablado, Ploeg, & Failler, 2020a).

The self-awareness in ESD can be improved by practicing their mind, body, and mind and body together. He or she can concentrate on valuable self-reflection or the reflections of others. The mind should concentrate on the present moment to set goals that are important to both oneself and others. At the same time, to achieve the goals, he or she must first understand one's strengths, weaknesses, and limitations so that one can devise action plans and know when to seek assistance (Lopez, 2017; Zaffiro et al., 2020a).

2. Systems thinking

Systems thinking is the process of thinking about how a person can see the relationship of the entire complex system (Zaffiro et al., 2020a). It is the capacity to perceive and grasp linkages, assess complex systems, examine how systems are integrated across several domains and scales, and cope with uncertainty. It illustrates that even if the situation is complex, a person should be able to see the larger picture as a whole.

However, the individual must be aware of the complexities and be able to deal with them. It enables the individual to comprehend the complex relationships that exist in systems that are embedded as wholes and to deal with uncertainty (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). The concepts can be linked to wisdom development by Payutto (2018), which

focuses on acknowledging and balancing behavior and mind. To deal with uncertainty, it suggests that the person adjusts and balances their thinking and action.

Systems thinking in ESD refers to the ability to:

1) Recognize and understand relationships in a whole picture
2) Analyze and synthesize embedded relationships among them

A mental model is an appropriate tool for assessing systems thinking because it can assess how a student understands concepts and solves problems in complex systems (Fraune, 2013)

A teacher can use a mental diagram, such as a causal loop diagram, to map students' ideas of the whole system relationships and learn the complex interactions to improve systems thinking (Atwater & Pittman, 2006).

3. Critical thinking

Critical thinking skills are higher-order thinking abilities that include the ability to think logically and cognitively. It is strongly related to higher-order thinking in academic literacy (Bloom et al., 1956; Laoriendee, 2011; McKeown, 2002; Panich, 2012) and is also one of the necessary skills for fostering long-term understanding and development in students (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017).

McKeown (2002) claims that critical thinking in ESD is primarily concerned with value issues. Critical thinking, it is argued, entails the ability to question, recognize, evaluate, and infer conclusions. It claims to work in tandem with problem-solving abilities, which could lead to confidence in addressing issues of sustainable development (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; UNESCO, 2017). This is related to critical thinking in the ESD concept proposed by Raufflet et al. (2009), as it

entails learning to question and recognize assumptions to examine the major structures in sustainable development.

Critical thinking in ESD refers to the ability to:

1) Question current norms, practices, opinions, and beliefs
2) Recognize the assumptions underlying our understanding, views, and opinions
3) Reflect on one's values, perceptions, and actions

The following five abilities can be used to assess critical skills for sustainable development (Moore & Parker, 2015; Nachairit, 2014; Watson & Glaser, 1964-2002).

1) Assumption Recognition: A critical thinker should be aware of the various sources of information but should be able to identify and select the correct assumption based on good decision-making.
2) Interpretation: A critical thinker can think logically to interpret ideas that go beyond references and facts and lead to appropriate consumption.
3) Induction and deductive reasoning: A critical thinker can draw conclusions based on facts or undeniable data based on experiences. Among contradictory, insufficient, or ambiguous information, he or she can recognize and identify rational claims that lead to reasonable conclusions.
4) Assess the credibility of collective pieces of evidence: A critical thinker can offer a variety of professional evidence-based sources. The evidence should be relevant, correct, and precise to support the conclusions of ideas.
5) Evaluation: A critical thinker can logically organize and construct the final evaluation based on the arguments and evidence.

A teacher should facilitate students' work through well-designed instruction and a classroom environment to prepare students in advance to be confident in sharing their ideas with peers to improve students' critical thinking.

The instruction should follow Bloom's taxonomy of six levels of thinking, progressing from basic conceptual understanding to application of knowledge in real-world problems (Atkinson, 2019; Gerald, 2013; Nonis & Hudson, 2019).

4. Integrated problem-solving

It is the ability to solve problems using various methods and competencies (Aamodt, 1991; UNESCO, 2017). It is based on UNESCO concepts from 2005 and 2012 to focus on problem-solving skills to address and solve the dilemmas and challenges of sustainable development. It mentioned using a variety of methods in the learning process to solve problems that are both locally and globally relevant.

According to McKeown (2002), one key competency is the ability to integrate multiple processes such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing to solve a problem. This concept is based on Payutto's (2018) wisdom development concept, which addresses the use of metacognition to solve a problem through a variety of methods (both qualitative and quantitative).

In summary, integrated problem-solving in ESD is the ability to:

1) Apply different problem-solving frameworks to complex problems
2) Develop and implement innovative solution options
3) Use various processes in learning

A rubric assessment is an appropriate tool for assessing integrated problem-solving skills. It addresses the levels of achievement in each integration because the skill refers to the use of multiple methods and frameworks for problem-solving (Eisenberg & Berkowitz, 1987, 2018).

To improve integrated problem-solving skills, a teacher should design effective instruction that focuses on the transition from conceptual understanding to real-life

problem-solving. The problem-solving model is used in the instruction, but the learning resources should encourage students to engage in problem-solving and think logically, precisely, and concisely (Chong, Shahrill, & Li, 2019).

5. Collaboration

Collaboration inspires a group to develop shared values to cooperate with social responsibility. It can lead to novel working methods, the mobilization of difficult-to-access expertise, and the establishment of shared accountability in a more complex world (Albrectsen, 2017; Reeves, 2019). It focuses on the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting (McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017).

It allows the individual to participate in making decisions about themselves while also empowering various people and groups (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; Raufflet et al., 2009). It is consistent with the ESD concepts in Buddhism that a person should behave well in his or her way of life and not encroach on the rights of others. The individual should be aware of his or her role in the community and be positive to others, not only to other people but also to nature (Payutto, 2018).

In summary, collaboration in ESD refers to the ability to

1) Participate in the group decisions
2) Learn from others
3) Communicate effectively to promote dialogue and negotiation to deal with conflicts

A self-evaluation tool is useful for assessing collaboration because it allows a student to check and evaluate his or her performance to be aware of personal goals, contributions, communication with others, and collaboration with peers (Borden & Perkins, 1999).

To improve collaboration, a teacher should encourage a collaborative classroom in which learners and teachers can design and share learning and authority collaboratively (Tinzmann et al., 1990). Effective communication, appropriate instructions, material use, and group processing must all be addressed while maintaining positive independence and individual accountability. Interpersonal skills among and within groups, as well as real-time interaction, are essential (Ibrahim et al., 2015).

The conceptual framework can be summarized in *Figure 1.*

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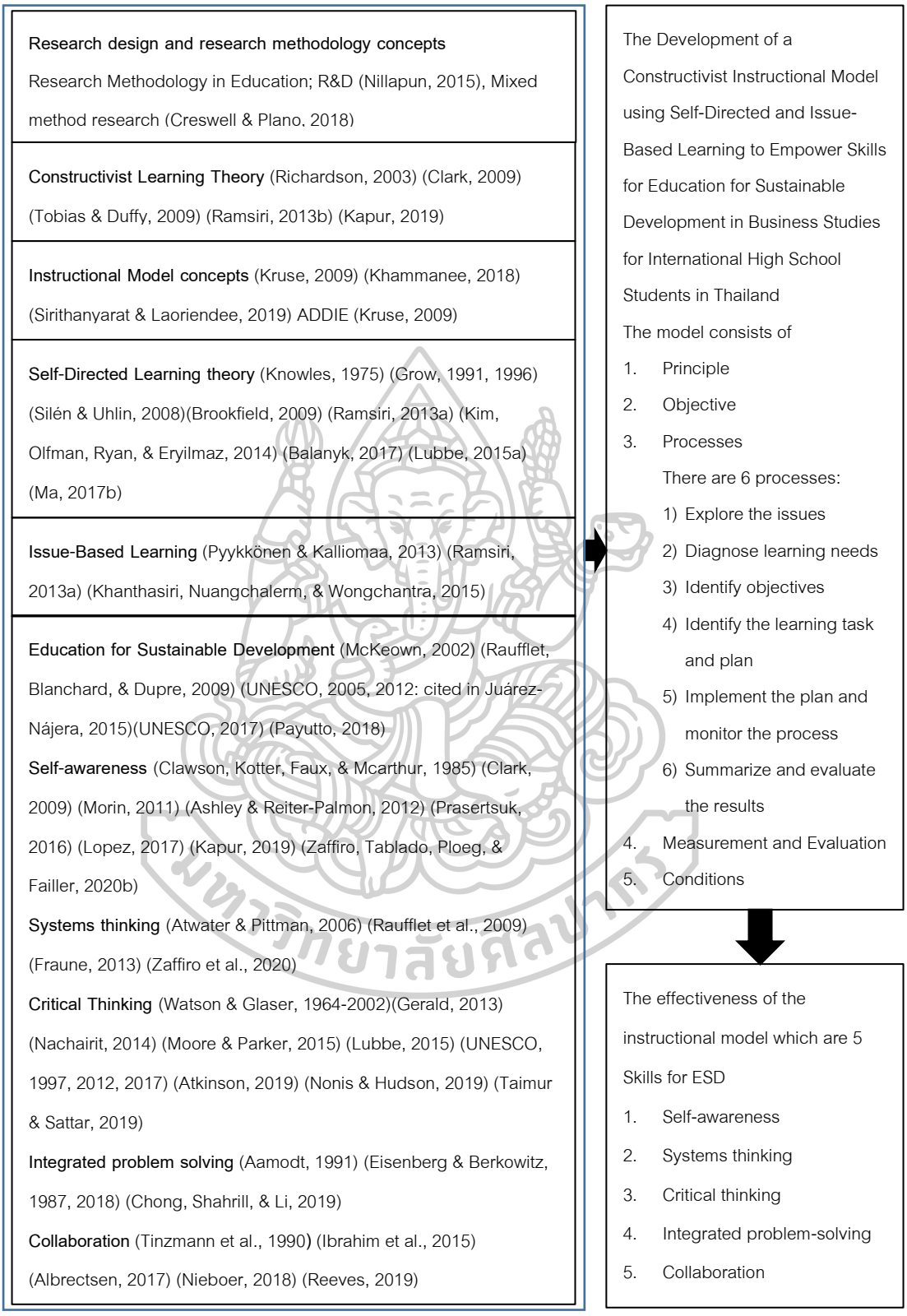

Figure 1 Conceptual Framework

1.3. Questions of research

1. How is the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand?
2. How effective is the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and at what level?
    2.1. How is the effectiveness of the instructional model to empower self-awareness in ESD and at what level?
    2.2. How is the effectiveness of the instructional model to empower system-thinking in ESD and at what level?
    2.3. How is the effectiveness of the instructional model to empower critical thinking in ESD and at what level?
    2.4. How is the effectiveness of the instructional model to empower integrated problem-solving in ESD and at what level?
    2.5. How is the effectiveness of the instructional model to empower collaboration in ESD and at what level?

1.4. Objectives of research

1. To study and develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.
2. To study the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills
    2.1. To study the effectiveness of the instructional model to empower self-awareness in ESD and the level of skill

2.2. To study the effectiveness of the instructional model to empower system-thinking in ESD and the level of skill

2.3. To study the effectiveness of the instructional model to empower critical thinking in ESD and the level of skill

2.4. To study the effectiveness of the instructional model to empower integrated problem-solving in ESD and the level of skill

2.5. To study the effectiveness of the instructional model to empower collaboration in ESD and the level of skill

1.5.Delimitation of the study

Independent variable

The constructivist instructional model using self-directed learning and issue-based learning

Dependent variable

the effectiveness of the constructivist instructional model using self-directed and issue-based learning

Population

The population consists of Mahidol University International Demonstration School Business Studies students in grades 10, 11, and 12 in the class of 2021.

Sample of the studies

The sample consists of 12th-grade students in the Skills for Leadership and Management 12B1 class of 2021. There are 24 students in total. The researcher used cluster random sampling from ten business elective classes. The subject is available as an elective with no prerequisites. The sample is homogeneous, with participants drawn from a variety of core classes and educational backgrounds.

Time frame

The research will last 10 weeks in quarter 4, semester 2 of the 2022 school year (during January-March 2022). Each week consists of three periods, so the researcher spends 30 hours in class.

Content

The content used in the study is UNIT 4 “M-Business”.

1.6.Definitions

Constructivist Instructional Model using Self-Directed Learning and Issue-Based Learning refers to an instructional model that focuses on independent higher-order thinking skills and changing behavior to meet the goals of education for sustainable development. The model consists of 1) principle 2) objectives 3) processes 4) measurement and evaluation, and 5) conditions. The processes have 6 stages called the EDIIIS model which is 1) Explore the issues 2) Diagnose learning needs 3) Identify objectives 4) Identify the learning tasks and plans 5) Implement the plan and monitor the process, and 6) Summarize and evaluate the results.

the effectiveness of the constructivist instructional model using self-directed and issue-based learning refers to the results after the model implementation to empower the skills for ESD which are 5 skills: 1. Self-awareness 2. Systems thinking 3. Critical thinking 4. Integrated problem-solving, and 5. Collaboration and the levels of skills. The effectiveness can be assessed by analyzing the student performance from the Skills for ESD evaluation form. The level results are measured by five scale rubrics created by the researcher using the SOLO Taxonomy concept.

1. **Self-awareness** refers to the ability to reflect perceived experiences within a multidimensional phenomenon while also being aware of personality traits, goals, emotions, attitudes, preferences, intentions, and so on to move to action in the

future. The **self-awareness in ESD** addresses reflecting on one's role in a community that shares the values and principles that underpin sustainable development and society to set visions and plans for the future. It must meet the following requirements.

a. The ability to be aware of one's need by reflecting on his/her role in society
b. The ability to create a clear and valuable vision, and plan for the future
c. The ability to move from awareness to knowledge to action.
d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes

2. **Systems thinking** refers to the ability to see the big picture of a whole system in complex relationships and comprehend its dynamic interactions and feedback loops, which are characteristics of complex adaptive systems. **Systems thinking in ESD** addresses how a person recognizes, links, and synergizes embedded relationships while solving problems to synthesize various concepts. It must meet the following requirements.

a. The ability to recognize and understand relationships in a whole picture
b. The ability to analyze and synthesize embedded relationships among them

3. **Critical Thinking** refers to the ability to think logically and cognitively by gathering sufficient knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. To meet the following criteria, **critical thinking in ESD** should address the value issues, dilemmas, and challenges of sustainable development.

a. The ability to question current norms, practices, opinions, and beliefs
b. The ability to recognize the assumptions underlying our understanding, views, and opinions
c. The ability to reflect on one's values, perceptions, and actions

4. **Integrated problem-solving** refers to the ability to use one's knowledge and experiences to solve a problem using a variety of methods. **Integrated problem-solving in ESD** addresses how a person can apply various skills and innovative solutions to model the learning process and solve the problems and challenges of sustainable development. It must meet the following requirements.
    a. The ability to apply different problem-solving frameworks to complex problems
    b. The ability to develop and implement innovative solution options
    c. The ability to use various processes in learning
5. **Collaboration** refers to the ability to collaborate as a cross-sector partnership to generate shared values to cooperate with social responsibility. **Collaboration in ESD** refers to the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting. It must meet the following requirements.
    a. The ability to participate in the group decisions
    b. The ability to learn from others
    c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts

Business Studies refers to the Grade 12 subject Skills for Leadership and Management at Mahidol University International Demonstration School.

International high school students in Thailand refer to Mahidol University International Demonstration School students in grade 12.

1.7.Significance of the Study

The researcher is primarily concerned with the academic contributions of teachers or researchers who are concerned with promoting education for sustainable development. The study examines the effects of a constructivist instructional model based on self-directed and issue-based learning on the development of skills for ESD in business studies for international high school students in Thailand. The study demonstrates a significant idea to build quality education to meet the goal of sustainable development. Teachers can also apply the findings of this study to other subjects and grade levels. This study can serve as a model for future research.

Students benefit from enhancing their ESD skills to become lifelong learners and good global citizens in the future. They will gain self-awareness and a better understanding of what is important to them and their communities. They will learn to think in terms of systems to comprehend the complex interrelationships of various things. Students will improve their critical thinking skills and learn to integrate problem-solving techniques to solve a problem related to sustainable development goals. Finally, students will learn to collaborate with others.

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Chapter 2

Literature Review

In chapter two, the researcher conducts research on relevant documents and theories to comprehend the statements and needs to develop an effective instructional model to empower skills for ESD in Business Studies for international high school students in Thailand. The following are the contents.

2.1. Mahidol University International Demonstration School, Business Curriculum
    2.1.1. Social Studies Curriculum: Skills for Leadership and Management
    2.1.2. Background of Learners in MUIDS
2.2. Instructional model Concepts
    2.2.1. Instructional Model Meaning
    2.2.2. Types of Instructional Models
    2.2.3. Instructional System Design
2.3. Constructivist Learning Theory
    2.3.1. Self-Directed Learning
    2.3.2. Issue-Based Learning
2.4. Education for Sustainable Development
    2.4.1. Self-Awareness
    2.4.2. Systems Thinking
    2.4.3. Critical Thinking
    2.4.4. Integrated Problem-Solving
    2.4.5. Collaboration

2.1. Mahidol University International Demonstration School Curriculum

Mahidol University International Demonstration School (MUIDS) was established in 2013 by Mahidol University. It is a secondary school for students in grades 10 through

12. The school provides a curriculum design that combines three educational standards from both Thai and American educational standards to improve students' chances of admission to any Thai and International program in Thailand and abroad.

The curriculum standards are from:

1) The Basic Education Core Curriculum in Thailand
2) The Thai Language and Culture Content Standards
3) The California Public Schools Common Core Standards

As stated in the Royal Thai Government Gazette, vol. 125, part 80D, 12 May B.E. 2551 (2008), an international school uses an international curriculum or one that has adopted a new curriculum that differs from the curriculum of the school's home country. The school may develop a curriculum that differs from the national curriculum established by the Ministry of Education. Only foreign language instruction should be provided. The international curriculum incorporates several educational systems, including the American curriculum, the British curriculum, the baccalaureate or IB curriculum, and other national curricula. International schools in Thailand can also tailor their curriculum to meet the needs of their students, which are determined by their school's strengths and weaknesses. The American Curriculum is used at Mahidol University International Demonstration School. The teacher must create curriculum maps that are aligned with a subject's standards that have been adapted from American Common Core Standards by a State Board of Education.

MUIDS PHILOSOPHY

MUIDS is dedicated to being the "Wisdom of the Land" by implementing best practices in education. The educational process promotes the development of the whole person by emphasizing experiential and service-learning, as well as social involvement, and instills a consciousness of commitment to engage and contribute to create a better world to reside.

EXPECTED SCHOOLWIDE LEARNER OUTCOMES

The Expected School-Wide Learner Outcomes, which are derived from Mahidol University's core values and 21st-century global literacy skills, are taught in developmentally appropriate ways at each grade level.

Table 1 MUIDS expected schoolwide learner outcomes

Strategic Learners	Students may determine what they need to know and understand for themselves. To assist students in improving, they should be allowed to reflect on their learning as well as the process of overcoming any mistakes. They should be able to use technology to effectively arrange their study.
Innovative Thinkers	Students should notice the possibilities for fresh ideas and methods of thinking. They should be able to build on other people's ideas, explanations, and justifications, use what they know to analyze, assess, and solve issues, be creative and innovative, and use technology to generate high-quality outcomes.
Articulate Communicators	Students should understand how to interact with others. They should be good listener and effective communicator for a variety of reasons and in a variety of ways. Students may describe what they understand and how they comprehend other social groupings, and they can utilize technology and media to clarify, explain, and articulate their thoughts.
Morally Intelligent Persons	Students should understand how to make good decisions. They should exhibit moral, honest, and right behavior in accordance with our society's laws. They should promote communal honesty, fairness, and harmony. They should demonstrate that they are diligent and caring by employing technology in non-harmful ways.

Altruistic Global Citizens	Students should understand how to be decent global citizens. They must maintain a healthy lifestyle and act responsibly as citizens. They must appreciate other cultures and people who differ from them. They should be concerned and responsible for the community's well-being, and they should use technology to encourage community service.
Leaders for The Future	Students should understand what successful leaders do. They should understand how to foster cooperation and leadership in order to attain common goals. They should be able to work through their disagreements and accept group choices, as well as analyze how effectively they work together and provide useful feedback to one another. They must utilize technology to solve issues and collaborate on projects.

MUIDS has established a set of standards, benchmarks, and ESLOS that all students are expected to meet by the time they graduate, through the formal educational process and extra-curricular activities. Teachers create engaging and challenging instructional units to engage students in learning and help them develop high-level thinking and problem-solving skills. To measure student progress, various assessment strategies are integrated into the teaching. Self- and peer-evaluation are also encouraged. To accomplish this, assessment rubrics are created to identify the desired outcomes and features of an assignment or project.

2.1.1. Social Studies Curriculum: Skills for Leadership and Management

MUIDS's Business Studies department is part of the Social Studies department. Business Studies courses or areas of study teach the fundamentals of business, management, and economics (Cambridge Business English Dictionary, 2011). MUIDS business studies electives include Business Management, Entrepreneurship,

Accounting, Marketing, Finance, and Skills for Leadership and Management. The courses offered each year are subject to change based on the needs of students and the availability of school resources. The researcher focuses on the Skills for Leadership and Management class, which is a 12th-grade elective at Mahidol University International Demonstration School.

Table 2 Social Studies Curriculum Structure

Grade	Course	Subject	Credit(s)	Period(s)/ Week
10	Core	World History	3	3
	Elective	Introduction to Business*	3	3
11	Core	World History II	3	3
	Elective	Accounting*	3	3
		Economics*	3	3
		Introduction to Psychology	3	3
		Marketing and Advertising*	3	3
12	Elective	Economics*	3	3
		Financial Valuation & Investment*	3	3
		International History 1871-1945	3	3
		International Relations	3	3
		Entrepreneurship*	3	3
		Introduction to Political Science	3	3
		Introduction to Psychology	3	3
		Sociology	3	3
		Marketing and Advertising*	3	3
		Skills for Leadership and Management*	3	3
		Skills for Life*	3	3

The marked (*) subjects are Business Studies electives of the Social Studies Department.

Skills for Leadership and Management

This course covers the fundamentals of management, including planning, organizing, leading, and controlling. Knowledge management, decision making, teamwork, motivating for performance, communicating, leadership, change management, and managing technologies and innovation will be covered in both conceptual and practical terms at the high school level. Students will work in groups as well as individually. Personal development projects for university applications, social change projects, and meta-cognition projects are among the projects. Personal journals and evaluations will be used to organize various self-empowerment practices to suit student learning.

VISION

The Executive Directors of the Student Council Associations in each of the ten states of Region 7 of the National Association of Student Councils in the United States of America created the Student Leadership Standards. Montana, California, Idaho, Utah, Washington, Nevada, Hawaii, Oregon, and Alaska are among the states represented by the National Association of Student Councils. The standards are intended to serve as guidelines for developing and teaching Student Leadership classes across the country. It is intended to assist leadership educators in developing an effective and relevant Leadership program. The curriculum is designed to foster lifelong learners while also supporting and enhancing academic curricular areas.

Table 3 Skills for Leadership and Management Standards and Benchmarks by Student Council Associations of each of the 10 states of Region 7 of the National Association of Student Councils

Strand	Standards	Benchmarks
1. Communication	1.1 Student communicates effectively in large and small groups.	1.1.a Student develops content and ideas into organized presentations. 1.1.b Student analyzes and adjusts based upon the audience. 1.1.c Student uses appropriate language and style. 1.1.d Student expresses himself/herself effectively in interpersonal situations. 1.1.e Student identifies and understands non-verbal communication cues.
	1.2 Student writes effectively.	1.2.a Student organizes thoughts. 1.2.b Student employs appropriate writing format. 1.2.c Student exhibits appropriate word use and grammar.
	1.3 Student listens effectively.	1.3.a Student listens and observes to gain understanding and interpret information. 1.3.b Student checks for accuracy and understanding by asking questions and paraphrasing. 1.3.c Student uses the listening level appropriate for particular circumstances and contexts.
	1.4 Student effectively uses various mediums of communication.	1.4.a Student communicates through oral, artistic, graphic, and/or multimedia presentations. 1.4.b Student demonstrates the use of available technology to present ideas and concepts.

Strand	Standards	Benchmarks
2. Organization and Managerial Skills	2.1 Student demonstrates self-organization.	2.1.a Student exhibits effective time management skills. 2.1.b Student prioritizes personal commitments. 2.1.c Student formulates & employs personal goals.
	2.2 Student plans & implements organized projects.	2.2.a Student formulates & employs project goals. 2.2.b Student uses sequential project planning steps. 2.2.c Student uses appropriate evaluation tools.
	2.3. Student demonstrates effective meeting skills.	2.3.a Student practices a variety of meeting formats. 2.3.b Student demonstrates meeting preparedness.
	2.4. Student understands the structure of his/her organization	2.4.a Student demonstrates knowledge of constitution & by-laws. 2.4.b Student identifies the chain of command in their school. 2.4.c Student understands & executes his/her job responsibilities & duties.
3. Business Skills	3.1 Student uses effective marketing skills.	3.1.a Student incorporates merchandising techniques, pricing strategies, and product display. 3.1.b Student utilizes various advertising techniques. 3.1.c Student identifies the target population.

Strand	Standards	Benchmarks
3. Business Skills (continue)	3.2 Student understands the financial aspects of student organizations.	3.2.a Student understands the elements of budgeting. 3.2.b Student understands appropriate accounting practices. 3.2.c Student understands the procedure for purchases and expenditures with student funds. 3.2.d Student understands school, district, state, and federal laws affecting student organizations.
	3.3 Student incorporates effective customer service techniques.	3.3.a Student understands the chain of command and resolves problems within the scope of their authority. 3.3.b Student recognizes and applies customer service strategies of handling mistakes, offering assistance, and accepting criticism. 3.3.c Student employs positive communication skills in customer service.
	3.4 Student understands aspects of financial obligations.	3.4.a Student applies rules of contracts and bidding. 3.4.b Student understands rules and regulations affecting student organizations.
4. Responsible Citizenship	4.1 Student takes responsibility for personal actions and acts ethically	4.1.a Student develops a sense of personal responsibility and self-confidence in their own abilities. 4.1.b Student demonstrates ethical behavior and acts with integrity. 4.1.c Student provides a model for others of personal responsibility and ethical behavior.

Strand	Standards	Benchmarks
4. Responsible Citizenship (continue)	4.2 Student respects himself/herself and others.	4.2.a Student has an awareness of the value of a healthy mind and body. 4.2.b Student demonstrates an appreciation of the work of others. 4.2.c Student acknowledges the individual rights of others. 4.2.d Student displays a positive attitude towards the beliefs & ideas of others
	4.3 Student participates in service to others.	4.3.a Student identifies the needs of others. 4.3.b Student responds to the needs of others by engaging in service. 4.3.c Student experiences the benefits of serving others.
5. Group Process	5.1 Student interacts in groups effectively.	5.1.a Student understands stages of group development. 5.1.b Student practices teambuilding 5.1.c Student recognizes functional roles of group members.
	5.2 Student understands how individual differences affect group processes.	5.2.a Student identifies leadership styles in himself/herself & others. 5.2.b Student identifies personality types in himself/herself & others.
	5.3 Student understands and utilizes strategies for problem-solving and conflict resolution.	5.3.a Student identifies the problem. 5.3.b Student identifies possible solutions. 5.3.c Student selects a solution.

Strand	Standards	Benchmarks
5. Group Process (continue)	5.4 Student understands decision-making processes	5.4.a Student identifies decision-making styles (autocratic, democratic, consensual, laissez faire). 5.4.b Student recognizes appropriate decision-making styles for a given situation. 5.4.c Student recognizes the impact of individual decisions on the group.
6. Goal Setting	6.1 Student understands the process of setting and achieving goals.	6.1.a Student understands the purpose of goal setting. 6.1.b Student writes goals that align with individual or group philosophy. 6.1.c Student develops an action plan to follow in order to achieve goals.
	6.2 Student identifies types of goals.	6.2.a Student differentiates between short-term and long-term goals. 6.2.b Student distinguishes between personal and group goals. 6.2.c Student understands the importance of setting balanced goals in multiple areas of life.
	6.3 Student employs the skills necessary to evaluate goals.	6.3.a Student monitors and adjusts goals. 6.3.b Student acknowledges the achievement of goals.

Table 4 Skills for Leadership and Management Course Structure

Skill12	Skills for Leadership and Management (Elective)	Subject Area Social Studies		
Semester 1	School Year 2022	Duration 87 hours 3 credits	Grade 12	
UNIT	Indicators		Duration	Weight
1. Foundations of Leadership and Management	1.1.a 1.1.b 1.1.c 1.1.d 1.1.e 1.2.a 1.2.b 1.2.c 1.3.a 1.3.b 1.3.c 1.4.a 1.4.b 5.1.a 5.1.b 5.1.c 5.2.a 5.2.b 5.3.a 5.3.b 5.3.c 5.4.a 5.4.b 5.4.c		24 hours	25%
2. Personal Development	6.1.a 6.1.b 6.1.c 6.2.a 6.2.b 6.2.c 6.3.a 6.3.b		18 hours	25%
3. Leadership Through Social Influence	4.1.a 4.1.b 4.1.c		6 hours	10%
4. Leadership project	2.1.a 2.1.b 2.1.c 2.2.a 2.2.b 2.2.c 2.3.a 2.3.b 2.4.a 2.4.b 2.4.c 3.1.a 3.1.b 3.1.c 3.2.a 3.2.b 3.2.c 3.2.d 3.3.a 3.3.b 3.3.c 3.4.a 3.4.b		30 hours	40%

In summary, the course aims to improve students' knowledge, abilities, and attitudes, which serve as the foundation and are required to enable them for competing in a global, information-based economy. These meet the MUIDS Leadership course standards as well as the school ESLOs to demonstrate real-life learning as pathways for students' future as lifelong learners.

However, in order to create an effective teaching approach that meets both the curriculum's and the research's ESD goals, the learners' backgrounds were researched to understand the statements, challenges, and expectations in student learning.

2.1.2. Background of Learners in MUIDS

The students come from a variety of backgrounds and have varying levels of knowledge. A majority (56 percent) of MUIDS students (Student Enrollment Academic Year 2020-21) attended a school with an English Program, in which a significant portion of a student's classes are taught in English and the academic program follows the Thai national curriculum. Some English Program schools may be bilingual as well. The next largest proportion of MUIDS students come from Thai programs: classes are taught in Thai and follow the Thai national curriculum. The Thai and English programs take a more traditional approach to instruction, which may be more lecture-based and teacher-centered. As a result of having learned to rely on their teachers, students may lack self-direction. Approximately 23% of MUIDS students come from an International Program, where all classes and activities are taught in English and follow an international curriculum with more student-centered approaches. Only 1% are from other countries (SCHOOL, 2021). *Figure 2* depicts this.

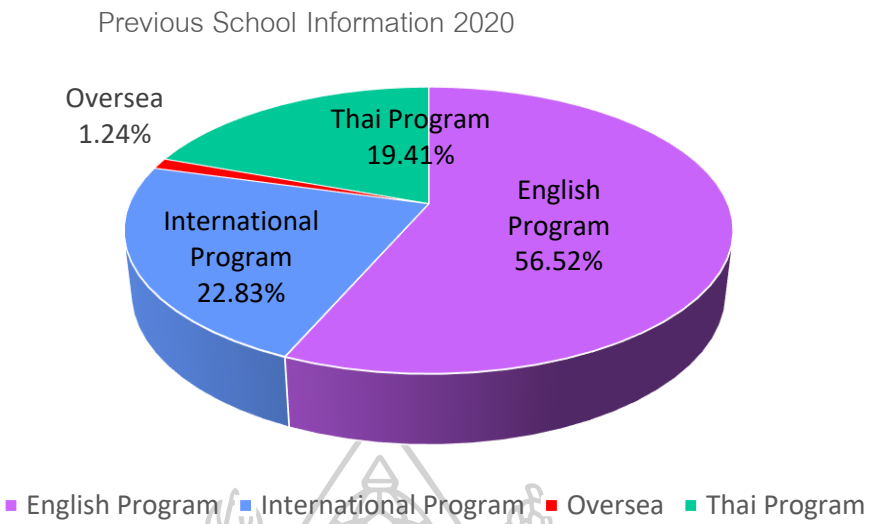


Figure 2 Previous school information of MUIDS students in 2020

According to demographic statistics, 99.36 percent of students are Thai, while 0.64 percent are Chinese, Thai-American, Thai-Japanese, and Thai-Taiwanese. Only 1.24 percent of students are native English speakers. The majority of MUIDS students are native Thai, English, and Chinese speakers (92.24 percent speak Thai as their native language). Because the majority of families speak languages other than English, there are significant intercultural and communication issues between English-speaking, Western-educated teachers, and student families. To address them, the school provides written communications in both Thai and English, as well as translators when necessary.

MUIDS uses the TOEFL ITP (also known as the paper-based TOEFL) to assess incoming and continuing students' ability to use and understand English in an academic setting. According to the report's statistics, the majority of students in all grades received a TOEFL score of less than 500. Similar to the Class of 2019, one trend observed in the Class of 2020 appears to show that groups scoring below 549 have improved in performance, implying that English instruction may have had a significant impact on language acquisition. Students who scored 550 or higher made significant gains between grades 11 and 12. Although the scores for the 2019-20 school year are

not yet available, any student who did not initially meet the requirement did so through the IELTS or an online alternative intensive course organized by MUIDS.

The majority of MUIDS students are ESL (English as a Second Language) learners, as can be seen. There may be some consequences from frustrating times when communicating their needs and ideas explicitly to what they desire. It makes many people feel isolated from others, which can impede their learning (Kress, 2008).

ESL students are expected to interact, acquire, process, and create information primarily in English. However, the researcher discovered that only about one-fifth of the students struggle with using English to understand the class lessons. This is supported by the Admissions evaluation over the last three years (accepted class of 2019-2021). According to the 2019 results, well over half of the students received a moderate score on writing and interview skills. However, teachers have stated that in the years 2020 and 2021, students appear to be more highly skilled and motivated, with a better command of English (SCHOOL, 2021).

MUIDS provides a variety of courses to meet the needs of students in their areas of interest. Students' interests are diverse, as evidenced by their participation in 43 different elective classes (as of the school year 2021). According to graduate statistics, students were accepted to various fields of study, with the majority of them majoring in business over the last five years (2016-2020).

This may lead to the conclusion that a sizable number of students are struggling with self-direction as a result of their previous school experience. Significant intercultural and communication issues are also caused by family background and demographics. Some students may have a language barrier that prevents them from understanding the lesson explicitly in the classroom, preventing them from acquiring knowledge and meeting learning outcomes. This is why it is recommended that appropriate learning approaches be developed to empower students in self-direction and to learn how to

learn to meet their various needs and backgrounds, including being effective global citizens.

2.2. Instructional Model Concept

The instructional model, also known as the "model of teaching" or "model of instruction," is based on the same concept as the "instructional system" (Sirithanyarat & Laoriendee, 2019). Regardless of the form of writing, one important distinction is that the two words, teaching, and instruction, are used differently. According to Khammanee (2018), these two words are simply different "names" of vocabulary. Except for the need to demonstrate conceptual differences relevant to the paradigm shift, the words' paradigm hasn't changed. Both have similar meanings in that they aim to transfer knowledge through various forms of interaction for students to learn and achieve. The term 'teaching' refers to the traditional method of teachers passing on knowledge to students in a passive manner. We now use the term "instruction" to refer to the actively transferring process that places a greater emphasis on the student center.

In terms of "format," the word model is primarily used as a subordinate of the word "system," which refers to a significant component of education and teaching management (Khammanee, 2018). The model refers to a tool designed to express ideas concretely for clarity. It demonstrates a clear structure that can be described, resulting in the expected outcomes. It must state a connection based on the various philosophies, theories, or learning principles, but not the theories themselves. The outcomes are frequently in the form of a deductive pattern, that is, using a predictive pattern (Kaplan, A., 1997; Keeves, JP, 1997: cited in Keeves, 2002).

2.2.1. Instructional Model Meaning

The concept of teaching has been mentioned from the past to the present for the definition of the instructional model, that teaching is the creation of various environments to facilitate learning to be most effective and productive (Joyce et al., 2015; Sirithanyarat

& Laoriendee, 2019). The model enables students to learn by interacting with its components, which nurture and stimulate a variety of learning outcomes such as knowledge, skills, and values. As a result, the instructional model is a method or approach to teaching the system of relationships between humans and ecosystems or environments to learners by stimulating, encouraging, and cultivating them. Learning allows students to learn by interacting with various elements in all of the previously mentioned human learning, beliefs, and concepts. It has evolved continuously from the original format in aiming to develop the competencies of learners to thrive in all dimensions; personal, social, and academic. Furthermore, the model is widely used in the planning of lessons, units, and curricula, as well as in the design of teaching materials and learning materials.

In summary, the instructional model refers to the systematic nature of teaching and learning. Some elements have been studied from the principles, theories, and concepts to be organized into a step-by-step process. It has been proven to be effective and can be used to achieve a specific purpose of a pattern. The following investigation of relevant instructional model types, model syntax, and their effects enables the researcher to understand the guidelines for designing an effective instructional model to meet the research goal.

2.2.2. Types of Instructional Models

Joyce et al. (2015) have categorized instructional models into 4 major families which are 1) information-processing family (basic and special purpose information-processing models of teaching) 2) social family 3) personal family, and 4) behavioral family.

1) Information-processing family

This family is concerned with how a learner obtains, organizes, and processes information. “Inductive thinking, scientific inquiry, picture-word, concept attainment,

Synectics, mnemonic, advance organizer, inquiry training, and cognitive growth" are examples of instructional models that align with this family. The methods are divided into two categories: "basic information-processing models of instruction" and "special purpose information-processing models of instruction". These models seek to foster the ability to learn, collect, and approach information with confidence. This is the first fundamental family that the learner must be familiar with and comprehend because it provides academic substance to other learning models.

2) Social family

This family believes in collaborative and cooperative learning that learners who share interests in particular things learn together effectively. It addresses the learning techniques to emphasize collaborative working and a democratic learning community. The instructional models that align with this family are partners in learning, group investigation, and role-playing as examples.

3) Personal family

This family focuses on developing learning methods to meet different learners' personalities. It addresses the building of self-awareness, self-understanding, and reflection, self-esteem, self-development while integrative communication with others. The instructional models that align with this family are non-directive teaching and developing positive self-concepts as examples.

4) Behavioral family.

This family focuses on how behavior leads to different approaches to learning to build the learner's learning capacity from the easiest to the most difficult level. In this family, the teacher plays an important role in teaching, training, enforcing, or even providing useful feedback to students for them to learn correctly. For example, explicit

instruction, mastery learning, and direct instruction are instructional models that align with this family.

In this work, the instructional model is aligned with the personal family to empower learners' ESD skills. The teacher primarily plays a supportive role by assisting students in developing self-awareness and confidence, providing a supportive learning environment, assisting and guiding students, and even collaborating with them to motivate students to learn effectively.

The component of the Nondirective teaching model has 2 major parts as follows.

1. Instructional effects
    1.1. Integrative communication
    1.2. Self-understanding and reflection
    1.3. Self-development
2. Nurturant effects
    2.1. Self-esteem
    2.2. Academic and social motivation
    2.3. Learning capacity and achievement

The model syntax compiles with 5 phrases which are:

Phrase 1 The students are encouraged to express themselves freely.

Phrase 2 The teacher encourage students to define the issue. Then, the teacher acknowledges and clarifies thoughts.

Phrase 3 The teacher supports the students when they discuss the issue.

Phrase 4 The teacher allows students to make preliminary decisions while assisting them to clarify potential choices.

Phrase 5 The teacher supports students to acquire new insights and takes more constructive behaviors.

In summary, instructional models are classified into four families: information-processing, social, personal, and behavioral. The personal family meets the research mostly to address the self-development skills in the long term. The instructor facilitates the student's ability to begin the process of self-development for lifetime learning.

In terms of instructional model design, instructional system design (ISD) is commonly used to enable a teacher to plan and design instruction and processes to meet learning objectives. A good ISD ensures that teachers achieve the expected results while also preventing process failures. Among other options, the researcher employs a well-known instructional system design known as ADDIE, which is a fundamental model of instructional development. It also corresponds to the research and development procedure used in this study.

2.2.3. Instructional System Design

ADDIE model was developed by Kruse (2009). It is a model of instructional development that employs a systematic approach to designing teaching and learning. The acronym stands for the five steps: analysis (A), design (D), development (D), implementation (I), and evaluation (E). The model is essential for any form of development that requires research. There are clear references to theories, concepts, and empirical experiments to validate the universally accepted model.

The ADDIE model consists of 5 steps with details as follows (Kruse, 2009).

1) Analysis (A) consists of data analysis, document analysis, and collection of preliminary evidence to identify problems, goals, or needs.
2) Design (D) is a design step that is drawn from the information obtained in the previous step. It is the step of planning to define the instructional model outline

in response to the goals. The outline consists of objectives, goals, demographics, methods, procedures, results, etc.

3) Development (D) is the creation of plans and materials or supporting documents to be used in conjunction with the analysis and design.
4) Implementation (I) is the step to delivering or using a plan.
5) Evaluation (E) is the final step, which is the measurement and evaluation of plan effectiveness. This leads to the final improvement of the model before being used or published.

The processes in the ADDIE model are similar to those in the research and development process. Research and development (R&D) consist of two main steps that focus on development and are easy to follow (Nillapun, 2015). In educational research, with a particular emphasis on educational innovation design. The steps are divided into four R&D phases: R1 D1 R2 D2.

1) Step 1 Research (R1) is to study and analyze data. It is to study to identify the problem and needs by collecting relevant documents and evidence. There should be study concepts, theories, documents, and research, which can be collected from secondary sources or primary sources.
2) Step 2: Development (D1) is the step of the design and development of the model. The synthesizing of the knowledge gained from step 1 helps to design and develop the initial innovation. Pilot trials and assessments may be conducted to find the quality and/or efficiency of the model.
3) Step 3 Research (R2) is the step for applying the innovation to the target group that is a sample in the study.
4) Step 4: Development (D2) is the step for the evaluation of the innovation effectiveness.

All steps are consistent, according to a study of both the ADDIE model and the R&D process. As shown in Table 5, similar steps can be summarized.

Table 5 The application of the ADDIE model and Research and Development processes

Instructional Design	Analysis (A)	Design (D)	Development (D)	Implementation (I)	Evaluation (E)
Research and Development	Research (R1)	Development (D1)		Research (R2)	Development (D2)
Actions	Studying the basics to identify the problems, needs to be analyzed as a guide for the instructional model design	Bring the analyzed information to design and develop the model outline, resources, and/or tools The model consists of 1) principle 2) objectives 3) processes 4) measurement and evaluation 5) conditions		Carry out the implementation of the model to study the results of use and improve the model	Assess the effectiveness of the model to improve the final amendment or guarantee the result

In summary, the ADDIE concept's instructional model has five stages that are consistent with the R&D process. It assists a researcher in developing an effective

instructional model that will produce the expected and predictable results. In this work, the model consists of 1) principle 2) objectives 3) processes 4) measurement and evaluation, and 5) conditions.

In the following section, constructivist learning theory and relevant learning pedagogies are studied to understand how the model principle and processes should be designed and developed to design a specific instructional model to empower skills for ESD.

2.3. Constructivist learning theory

Nieboer (2018a) investigated how the International Primary Curriculum can be used to achieve Education for Sustainable Development. Constructivism is defined by several educators. According to various perspectives on constructivist learning theory, it refers to the knowledge construction that a learner develops from his or her experience, social and cultural context, as well as new ideas or concepts that they come into contact with. It entails the cognitive process of learners actively learning with the help of their context. As a result, the constructed knowledge would be meaningful and would be based on truths and relevant experiences. (Ramsiri, 2013a; Richardson, 2003; Tobias & Duffy, 2009; Vanichwatanavorachai, 2019; Wanniarachchi, 2016).

There are two major forms of constructivism, which are 1) Cognitive constructivism, and 2) Social constructionism or social constructivism (Martin & Sugarman, 1996; Pradhan, 2021; Ramsiri, 2013a; Richardson, 2003; Somabut, 2013).

1) Cognitive constructivism

Cognitive constructivism has a philosophical foundation from an attempt to connect old and new experiences. It is sometimes referred as psychological constructivism, personal constructivism, or pedagogic constructivism (Taber, 2006). This approach is based on Swiss developmental psychologist, Piaget's ideas. It is the knowledge that arises from reflection when using a rationally proven process which is

regarded as a pragmatic philosophy, as well as the foundations of learning psychology that influenced the foundation of this concept. It holds that individual learners actively construct their understanding of phenomena and that these constructions are distinguished by the individual's prior knowledge.

The various ways in which a learner engages in social activities allow him or her to share and receive ideas. This aids the learner in the construction of new knowledge via "organization" and "adaptation" in cognitive progress. It means that if a person can organize their thoughts and experiences to adapt to how they have interacted with society, the person will assimilate new ideas and accommodate them to be aligned with existing knowledge. It then becomes formal knowledge. Additionally, Piaget (cited in Ramsiri, 2013a) believes that the differentiation of how fast an individual can construct formal knowledge relies on four factors which are maturation, experience, social transmission, and equilibration that links to self-regulation.

Although it seems to focus on the individual, it does not ignore the fact that the individual should develop from social interaction. However, in cognitivism, the emphasis remains on individual understanding growth, even when learning occurs in social situations (Pradhan, 2021). It can be divided into two parts: Ages and Stages, both of which predict whether children will be able or unable to understand something at different ages, and developmental theories that explain how students acquire cognitive abilities. There is an idea in learning management that we humans must "create" our knowledge through experience. These experiences encourage students to construct cognitive structures called “Schemas” and The brain's mental models.

Piaget's theory leads to an important conclusion. According to Piaget's concept, providing an environment for learners to explore is an important role. The classroom should be filled with interesting things that will encourage learners to become active creators of their knowledge by expanding the schema through experience with the

method of absorption (Assimilation) and modifications (Accommodation), which believes that learning comes from adjusting to a state of equilibrium (Equilibrium) between organic and environmental factors. The steps are as follows (Somabut, 2013).

1. assimilation into cognitive structures (Assimilation is an interpretation of taking information from the environment and adapting it to the cognitive structure.)
2. Intellectual restructuring (Accommodation) is the ability to adapt one's intellectual structure to one's surroundings by connecting prior knowledge with what needs to be learned again.

2) Social constructivism

This theory is based on Vygotsky's ideas. Lev Vygotsky believed that society and culture would provide the intellectual tools required for the development of intelligence forms and qualities. It believes that disciplines or knowledge have been constructed from human constructs derived from "mediators" such as values, beliefs, ideologists, politics, power exertion and status preservation, and economic self-interest. A sociocultural perspective that highlights the contextual character of intellectual activity and learning opposes the constructivist viewpoint. Both emphasize the significance of action in human learning and growth. Sociocultural theory, on the other hand, focuses on students' engagement in sociocultural classroom and extracurricular practices, whereas cognitive constructivism focuses on individual students' perceptual and conceptual processes (Martin & Sugarman, 1996).

According to the theory, these social factors influence how people construct their understandings and new knowledge with the belief that adults, or seniors, such as parents and teachers, will be the link for the overall socio-cultural apparatus. Children will develop in organized social groups. Appropriate technology use should foster relationships rather than isolate students from one another.

Teachers who adhere to the constructivist philosophy should create a learning context in which learners can be encouraged to engage in engaging activities that stimulate and facilitate learning. It's not just standing around and watching children explore and discover. However, when students encounter difficulties, teachers should provide guidance, and encourage students to work in groups to consider questions, and provide support. Motivating and directing them to solve problems, as well as difficulties, is the foundation of learning in a real-life situation in which learners are interested in and satisfied with the outcomes of their work. Teachers are thus present to assist students in achieving cognitive growth and learning at all levels.

A learning strategy based on Vygotsky's social constructivism may or may not include the same activities. Activities and themes may be modified as needed. However, the following three principles can be applied in the classroom (Somabut, 2013):

1. Learning and development represent the social aspect of collaborative activity.
2. Zone of proximal development should be following the curriculum guidelines, and lesson planning on the basis that learners with developmental zones will be able to learn on their own without assistance, but learners who are lower than the development zone, meaning they will not be able to learn on their own and need help from scaffolding.
3. Learning at school should take place in a relevant setting and should not be divorced from learning and knowledge gained through real-world experiences outside of school. There should be a link to the student's school experience.

Tobias and Duffy (2009) mention various points from several educators about the use of constructivism in education in their research work, which studied whether constructivist learning theory is considered a success or failure concept. According to the first group of educators, constructivism may not be appropriate for all instructional proposals. It may not be appropriate for sequential problem solving and may overlook

important aspects of the instructional process such as instructional dynamics, classroom social context, and learner motivation. The limitations are taken into account because they may be unable to advance learners' long-term memory of knowledge. Some argue that constructivism is more appropriate for adults because they have more ideas about their content knowledge and conditional knowledge as a result of their collective experiences than students who may have limited sources when applying a procedure. These educators appear to support the concept of explicit instruction, in which learners are given well-prepared instructions and guidance.

Others, however, argue that the cognitive process in the constructivist approach is more important to learners than those behavioral activities. They argue that how instructors provide effective guidance, rather than the amount of it, is the most important factor in promoting learning. They mention the use of various types of guidance, which demonstrates the concept of "scaffolding," such as using mastering questions and probes, as well as offering explanations that are appropriate for the student's current understanding. The construction of a comprehensive understanding can be found as evidence in many types of research that use constructivist approaches such as problem-based learning, discovery, and others. They argue that learning is more than just a change in a social activity that combines what is known with how one came to know it and knowledge application. Some researchers also argue that age isn't a factor in using the constructivist approach. Adults and students alike can learn abstract or complex ideas if the curriculum and instructions are carefully designed and the teacher provides support to help students learn to reason effectively to develop conceptual change and memory reorganization. Tobias and Duffy (2009) summarize the role of context in making guidance effective by relying on work examples given to students, which should be a similar problem that the students must solve. This allows students to make the connection and motivates them to solve the problem.

Moreover, even though some may disagree with some parts of the constructivist approach, they do all agree to advocate problem-based learning or inquiry-based learning to motivate learners in constructivism. The PBL advocates show that the instructional progress would require students to engage and invest effort in the construction. At the same time, the teacher should also encourage and challenge learners to think without attempting or dictating procedural thinking (Clark, 2009).

Clark (2009) further explains about Instructional “guidance” must only provide enough accurate procedural information for students to start the actions but not yet preview necessary learning or outcomes. However, it should demonstrate significant steps of action to accomplish the learning tasks. To encourage students to follow the guidance, it must guide the expected practices and outcomes which can be fulfilled by the full support and corrective feedback from teachers.

Clark (2009) also discusses further that teachers should focus on enabling students to discover procedures for discovering solutions, not to discover the solutions. It is hard for even adults to find solutions as one problem may contain many solution paths, or they might only be an acceptable resolution to a problem. Hence, the teacher should not expect students to discover solutions during instructions.

Ramsiri (2013a) concludes the constructivist concept by stating that 1) learning is the process by which learners construct knowledge for themselves. It necessitates self-regulation to reduce the contradiction in their thinking. 2) Learning is dependent on how learners use their cognitive domain to process data to meaningfully connect with the newly received information, and 3) participation in social activities has a significant impact on knowledge construction.

The guide to using constructivist approaches in instruction can be summarized as follows (Ramsiri, 2013b).

1) The learning outcomes should center on the learning process and raising awareness of it. The outcomes are derived from real-world practices in which the teacher serves as a model to guide students in learning while students construct their knowledge.
2) The goal of teaching has transformed from transferring explicit knowledge to demonstrating the process of the interpretation and creation of knowledge meaningfully. The learning of each skill should be effective and allow learners to solve problems in the future.
3) Students should actively learn during the instructional process, which is consistent with the nature of the learning process, in which learners should be active and determined by their intrinsic motivation and involvement in society. As a result, the teacher should challenge students with real-world context and examples relevant to the students' interests. As a result, students can study, investigate, and experiment to develop new ideas.
4) The teacher should create a sociomoral atmosphere in the classroom that enables students to learn from having social interaction and advance their learning in various ways.
5) Learners must give their full attention to their studies. They should direct their learning with self-regulation to learn on their own, such as selecting topics, planning, problem solving, or learning from peers.
6) The teacher should encourage learners' intrinsic motivation by planning activities that cater to their interests and assist them in learning.

According to Bhattacharjee (2015: cited in Kapur, 2019), the following are the consequences of constructivism for teaching and learning.

1) Teachers should facilitate, support, and guide the learners as models of learning.

2) Leaning is linked to the accommodation process of an individual's mental capacity's transformation and new experiences.
3) Learning addresses how an individual makes connections between information.
4) Instructional strategies should emphasize the complexity of the problems which do not only provide a single solution so that the individual can develop their thinking better.
5) Framework and personal knowledge should have a high significance.
6) Students should be assisted in developing the criteria that will be used to evaluate their work.
7) Teachers are those who have a sufficient understanding of academic subjects. They must ensure that the students can achieve their academic goals without encountering any problems or difficulties.
8) Students' learning is influenced by their prior knowledge. In other words, their prior knowledge serves as the foundation for the creation of new information.
9) The students' efforts and interests are more essential than the substance of textbooks.
10) In certain circumstances, teachers make judgments regarding how tasks and activities should be carried out. They are the ones with the most knowledge and experience.
11) Sense-making and critical thinking are valued more highly in constructivism than just content. Individuals must have sufficient information to make logical and rational decisions, rather than just obtaining knowledge of academic topics.
12) Experimentation replaces rote learning.
13) Instructional strategies or methods of education should allow students to apply both skill-based and open-ended approaches for them to possess the requisite skills and abilities for task and function execution.

14) Rather than being extrinsic, learning motivation is intrinsic. The kids must be sufficiently motivated to carry out the assignments and activities. They must be enthusiastic about their work and show an interest in it.
15) Students connect their classroom experiences daily, resulting in unique and personal knowledge.
16) Untested beliefs might serve as springboards for discussion, evaluation, and exploration of learning growth promotion.
17) The concept of "learning for transfer" is crucial.
18) Students learn best when they can discover and develop new information. When they develop their knowledge through learning, they do so in a well-organized manner.
19) Discovery and guided discovery allow students to learn by locating and supplementing material in terms of new concepts, as well as receiving helpful assistance and direction from teachers and peers.
20) To attain academic goals and objectives, students should actively engage in learning and study many topics.
21) Collaborative and cooperative learning between students and teachers, or between students and students, enables them to get a thorough comprehension of academic subjects and other elements.
22) Students should develop higher-order thinking skills while learning in the classroom and working toward academic goals. It allows pupils to make logical and reasoned conclusions, as well as improve their reasonable judgment.
23) To create multi-dimensional classrooms, a variety of activities in the classroom should be encouraged at different levels at the same time.
24) An individual's unique experience allows him or her to gain a better comprehension of academic themes and develop new knowledge.

25) While working in groups, students are urged to collaborate to develop ideas from diverse viewpoints and perspectives to build new knowledge while completing the project or assignment.

Some of the differences between constructivism writ large and constructivism writ small can be attributed to the nature of the assessments employed to assess pedagogical efficacy. Small-scale constructivist pedagogies are frequently assessed using non-constructivist methods. Students are given examinations to see how well they have developed their ability to remember data, execute abilities, and solve issues of a similar nature. These evaluations appear to be at odds with larger constructivist ideals. The constructivist-based assessment should focus on students' talents and dispositions to construct new information rather than only execute existing knowledge. This approach would be in line with constructivism assessments in general, which frequently use indirect methods to assess students' ongoing abilities to construct knowledge, such as examining cumulative effects or determining whether students are more likely to engage in new content and situations both in and out of school. (Bessant et al., 2013).

The constructivist pedagogy depicted in these and other depictions of the process have the following features (Richardson, 2003).

1) Individual attention and respect for students' backgrounds, as well as establishing understandings and opinions regarding domain features.
2) Promotion of group discourse that investigates a domain component to develop and share a topic’s common comprehension.
3) The deliberate and frequently unintentional insertion of formal subject knowledge into the dialogue by explicit teaching, a text citation, Web site study, or other ways.

4) By participating in exercises developed for this purpose, students are given systematic opportunities to challenge, determine, alter, or add to their present ideas and understandings.
5) Students become more conscious of their own understandings and learning processes.

It can be seen from the characteristics of constructivist concepts that the teacher's role is important to shift the information processing strategies. The teacher should allow students to drive lessons more. In the constructivist classroom, the teacher's role is also found to enable and empower students' skills of learning. As the theory concentrates majorly on supporting students in constructing their knowledge and controlling students' presence in the classroom during the learning process, the teacher should limit his/ her role, instead of facilitating and encouraging students to engage in collaborative learning. The constructivist teacher should encourage peer interaction, value learner reflection, and cognitive conflict.

In contrast, the students' role is to be actively engaged and more collaborative in the classroom to learn and explore various aspects to assist their learning. They must be sufficiently motivated to carry out duties and activities. They must be interested in their work and perform it with passion. As a result, the learning will be valuable and pertinent to their requirements, histories, and concerns.

In summary, using constructivism in instructional design requires the preparation of an effective plan, guidance, and support materials such as various cases or examples, tasks that allow students to enhance higher-order thinking, and a variety of activities. Moreover, the teacher would play an important role to facilitate and encourage students through all this learning progress and be a model of learning to them. The students should be motivated to discuss, exchange, and receive various ideas from different viewpoints, perspectives, and examples so, they would enhance their learning

together by bringing their previous knowledge or experience to be accommodated in constructing new knowledge.

The roles of teachers and students can be summarized as follows.

Roles of teachers

1. The teacher is a model of learning who should facilitate, support, and guide students to learn while students construct their knowledge.
2. The teacher should motivate student learning by challenging students with real context, and real examples relevant to students' interests.
3. The teacher should create a sociomoral atmosphere in the classroom that enables students to learn from having social interaction and advance their learning in various ways.

Roles of students

1. Students should be active and determined by their intrinsic motivation and involvement in society.
2. Students need to fully respond to their learning. They should direct their learning with self-regulation to learn on their own.
3. Students should establish their higher-order thinking while engaging in learning in classrooms along with the achievement of academic goals.

According to the two major types of constructivist learning theories, it can be seen that cognitive constructivism addresses the learning process while learning when an individual constructs new knowledge that is appropriate for self. The learning approach to meet the concept can be self-directed learning. The principle of the self-directed is how the students acknowledge the process of learning in which students are fully responsible for instructing their learning project. Meanwhile, social constructivism addresses the use of social factors to influence students to construct their

understandings and new knowledge. Thus, the learning approach which the researcher believes would suit this concept must allow students to work in a group so that they can exchange ideas and perceptions with others, that is issue-based learning. According to UNESCO (2012a: 15), one most famous ESD pedagogy is also issue-based or PLB. It is the strategy that moves from teacher-centered to student-centered lessons and addresses participatory learning instead of rote memorization. Hence, in this research, the researcher focus on the two major instructional models that meet ESD: the self-directed learning model (SDL) and the issue-based learning model (or problem-based or PBL).

2.3.1. Self-Directed Learning

Self-directed learning is sometimes misplaced with self-study or self-teaching. Candy (1991: cited in Silén & Uhlin, 2008) defines the similarity between self-directed learning and self-study as the process where students are on their own without anybody's assistance. Miflin (2004: cited in Silén & Uhlin, 2008) also interprets it as self-teaching while deconstructing the connection of adult learning, self-directed learning, and problem-based learning (PBL) in her research. The principle of the self-directed, then, can be assumed to be the process of learning in which students are fully responsible for instructing their learning project. Aligned with M. Knowles (1975), who defined self-directed learning as a "process in which individuals take initiative, with or without the help of others, in diagnosing their own learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes." These emphasize how students are aimed to plan, design, implement and evaluate their progress. They would design their essential questions and learning instructions. Bolhuis (1996) & Garrison (1997) (Silén & Uhlin, 2008) also argue that the self-directed project allows students to manage their learning methods from the problem statement, finding

resources, including action planning with self-monitoring, and self-evaluation to achieve a particular goal.

Knowles defines the contract of learning as the process of self-directed learning of planning on how and what knowledge, skills, attitudes, and values are acquired for the learner. It specifies how the learning objectives are listed and what evidence will be judged or validated. There is eight learning contract that learners have developed along while self-directing (Knowles, 1986).

1) Diagnose learning needs

Identify a particular learning goal from the needs of the gap between the current situation and the goal setting.

2) Specify learning objectives

List the specific objectives of what will be the outcomes, not how the learning process will be done.

3) Specify learning resources and strategies

Identify the learning resources and strategies for each objective and how the learner proposes to accomplish each of them. The resources refer to both material objects and human resources. The strategies refer to techniques and tools the learner employ to make use of them.

4) Specify evidence of accomplishment

The learner specifies the evidence which needs to be collected to indicate the degree to which he/she has achieved each objective.

5) Specify how the evidence will be validated

The verification needs to be provided to specify the specific method of evidence usage in judging each criterion. The learner specifies from the type of objectives that what criteria will vary.

6) Review your contract with consultants

Teachers or peers or expert people should review your contract, so they can suggest what works well or what does not.

7) Carry out the contract

The contract is carried out and can be revised while working

8) Evaluation of your learning

Get assurance from instructors, peers, or consultants by having them examine the evidence and validation data.

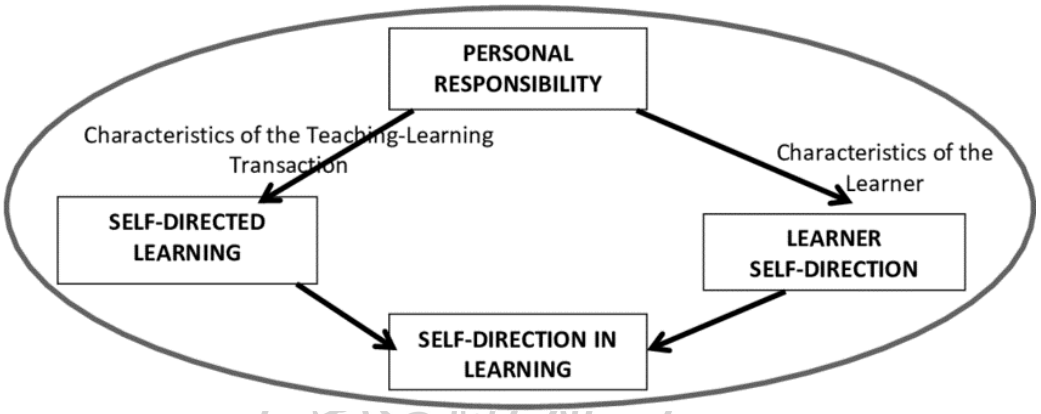
Brockett and Hiemstra (1991) firstly argue that self-directed relates to adult learning. They claim that the self-directed is combined two distinct dimensions of the instructional process and personal characteristics. The self-directed learner primarily processes his/her responsibility in learning as instruction meanwhile, learners' desire or preference is oriented to assuming the action in learning in the personality characteristic. However, later in 2012, they revised the ideas and introduced the revised model called "the PPC model" (Person Process Context Model) which is the updated version of their previous "PRO model" (Personal Responsibility Orientation Model).

The three updated elements of the PRO model can be summarized as follows:

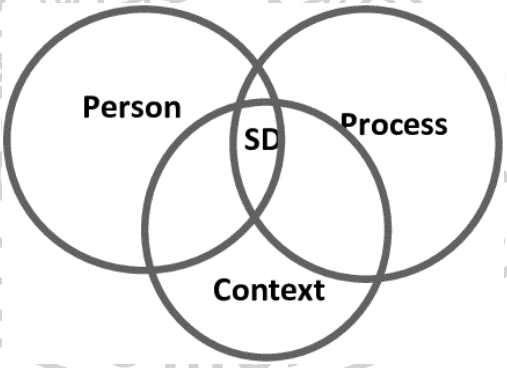
Person: The individual characteristics, background experience, motivation, personal norms, personal values, or education level.

Process: The transaction of the learning and teaching of how it is facilitated including the learning organization in planning, executing, and evaluating choices. It also involves personal learning styles, teaching styles, and possessive skills.

Context: The relevant environmental factors include social context such as political issues, organizational policies, financial status ar, and power affect the learning climate.



PRO model in 1991



PPC model in 2012

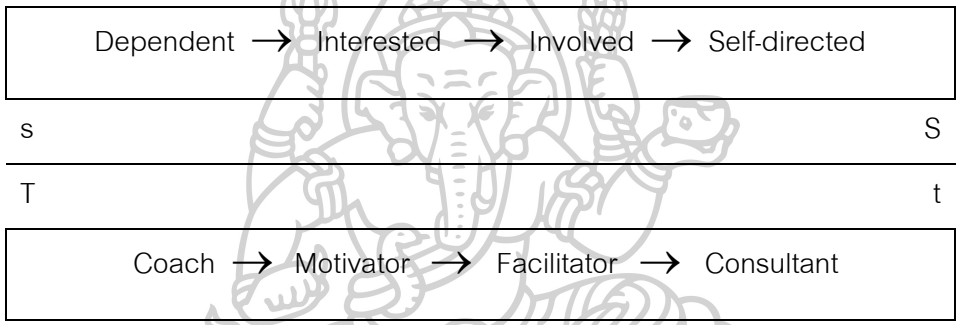
Figure 3 The PRO model in 1991 and the updated PPC model in 2012

Source: Brockett, R. G., & Hiemstra, R. (2012). Reframing the Meaning of Self-Directed Learning: An Updated Model. Adult Education Research Conference, (p. 22). Saratoga Springs, NY.

The key idea of the transformation to the PPC model is the dynamic balance between the three components. They suggest that learners will effectively learn the best when the instructional process is appropriately designed. The process should

encourage learners to flexibly direct their learning but with discipline. The sociopolitical context and learning environment should also be provided to support the overall process.

Grow (1991, 1996) argues the role of teacher and learner in self-directed learning which is four staged self-directed learning models. The blended approach shows that SDL is not an isolated process done by learners. The effective use of the SDL in instructional strategy should also consider the role of the teacher as a consultant which enhances student self-directed skills at the highest level as shown in *Figure 4*.



s = minimum student involvement

S = maximum student involvement

t = minimum teacher involvement

T = maximum teacher involvement

Figure 4 The Staged Self-Directed Learning Model

Source: Grow, G. (1991/ 1996). TEACHING LEARNERS TO BE SELF-DIRECTED. ADULT EDUCATION QUARTERLY, 41(3, Spring), 125-149.

The teacher has to design effective instruction to assist students to be better self-directed learners. For students with low self-direction or dependent learners, the teacher should use coaching at the beginning by giving them explicit instruction. The purpose of coaching is not for long-term use as we might consider that any student can be a dependent learner for a new topic temporarily. Once, students can find their interest or become “learners of moderate self-direction”, the teacher’s role is only to

motivate or guide the student and encourage them to work. In this stage, students are mostly found that are confident or smart but lack the motivation to learn.

The role of the teacher as a motivator is to encourage students to be more self-directed such as training them in such basic skills as goal setting. Thirdly, when learners are in the intermediate self-directed stage, which means they can plan and involve more in the goal development, the teacher will only facilitate and participate in the learning experience of students.

The student and teacher will be co-creator. However, in this stage, students are found still struggling in developing a deeper self-concept, better self-confidence, or better performance in participatory learning or working with others. The teacher can share in the decision-making process, but the students should be highly responsible for directing their learning methods and developing critical thinking. Lastly, when learners have high direction in learning performance, the teacher will only be a consultant or delegator. The teacher may consult with students during the evaluation part such as tools or emphasize students to advance their work in the next step. It is not a student working alone in this stage.

Ma (2017b) has conducted an integrated literature review to define the definition of SDL and present “the history of elaboration of self-directed learning and concomitant paradigm shifts” as shown in *Figure 5*.

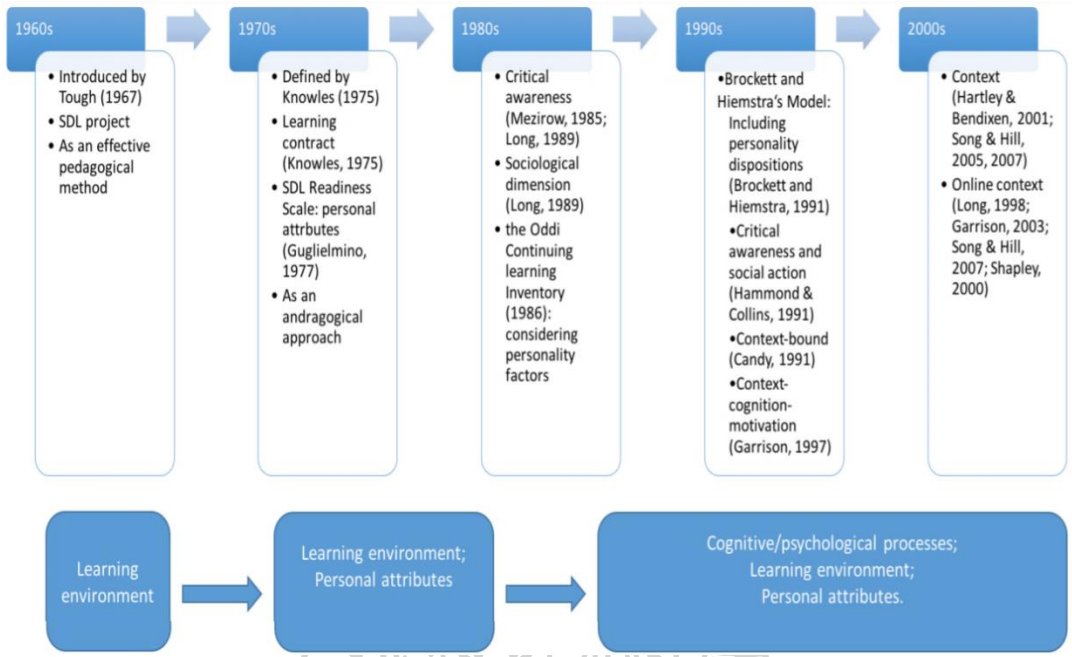


Figure 5 History of elaboration of self-directed learning and concomitant paradigm shifts

Source: Ma, X. (2017). An Integrative Literature Review of Self-Directed Learning in Higher Education. Ph.D. Thesis, Virginia Polytechnic Institute, and State University, Department of Curriculum and Instruction, Virginia.

He found that the recent studies after the year 2000 have shown the paradigm shift which connects to the change in technology. Self-directed learning in the digital era is also presented in distance learning and online learning where students use most of the cognitive process in learning new things on their own. From the 23 educators and researchers who are well-known in SDL studies, Ma has found some correlation in the definitions which links to three major dimensions which can be concluded in three levels as in *Figure 6*.

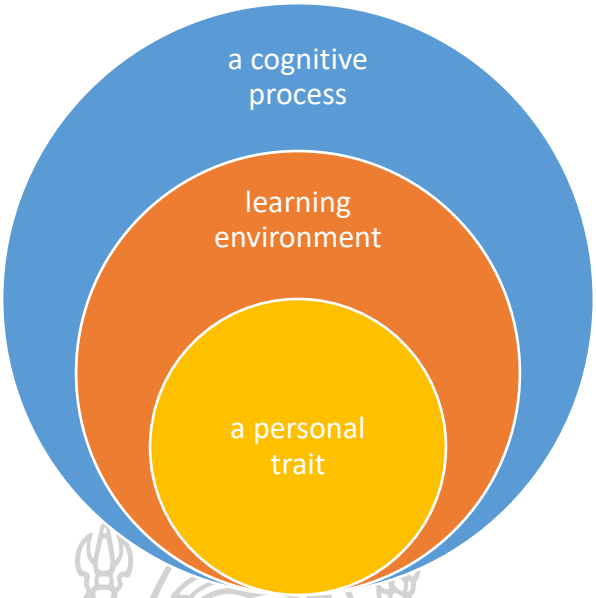


Figure 6 The three dimensions to consider in defining self-directed learning

Source: Ma, X. (2017). An Integrative Literature Review of Self-Directed Learning in Higher Education. Ph.D. Thesis, Virginia Polytechnic Institute and State University, Department of Curriculum and Instruction, Virginia.

In early definitions, the SDL is mostly focused on the personal attribute of adult learners. The learners are mostly motivated by the desired achievement of their own goals. Later on, the SDL is more focusing on the learning environment which assists students in self-directed learning. The use of materials, learning resources, learning supports, and even teachers are considered to facilitate learning oneself more. The usage of the facilitators was found to develop better self-directed learning even from teachers or peers. The final stage in recent definitions of SDL presents the stage where the cognitive process is mainly focused. In the personal attributes process, many definitions ignore the importance of the truth that the learners take full responsibility for planning, executing, and evaluating their learning. They'd rather refer to the application of theoretical foundations and less to the cognitive process.

According to Ma (2017a), the following self-directed learning qualities are shared:

1) The learner has purposeful objectives and can develop appropriate preparations.

2) The learner can implement a self-directed learning activity.

3) The learner persists in the process of learning.

From an internal standpoint, all of the similarities are centered on the learner. There are three processes in self-directed learning which are shown in *Figure 7*.

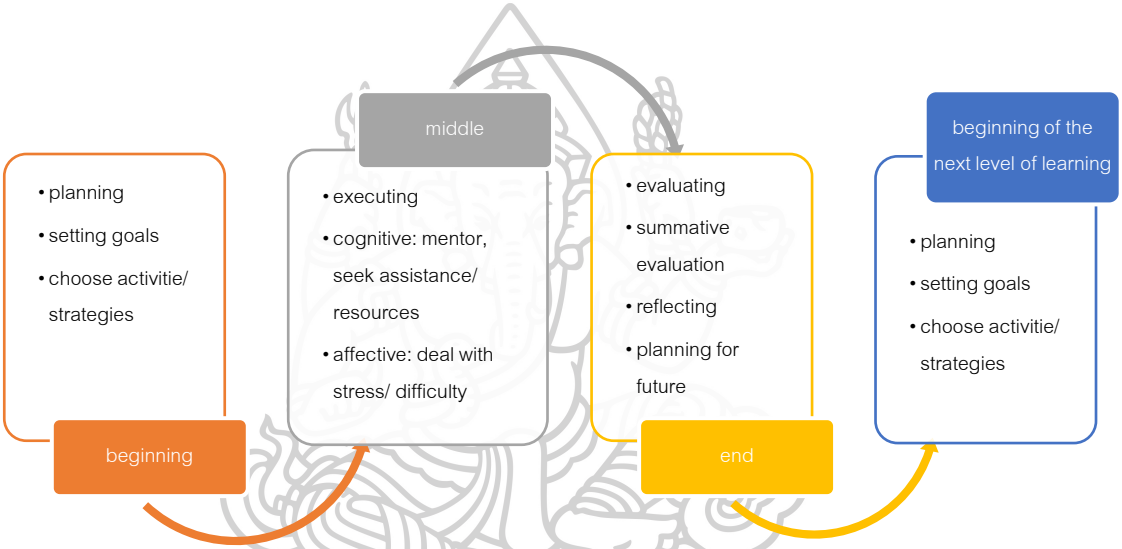


Figure 7 Self-directed learning as a planning-executing-evaluating process.
Source: Ma, X. (2017). An Integrative Literature Review of Self-Directed Learning in Higher Education. Ph.D. Thesis, Virginia Polytechnic Institute and State University, Department of Curriculum and Instruction, Virginia.

To begin, the learner must direct their learning and take responsibility to set and derive their goals and plans that are realistic and achievable. The learner should also select appropriate learning experiences and strategies for achieving the goals. In the executing process, the learner follows the plans of how the activities should be done while always supervises and monitors their progress. If they are struggle, they must know to seek for help, or supports from others to continue their process to achieve the goal. It requires self-management skills such as time management and resource

management which are relevant to their learning. The learner is more like an agent who beware of their own needs and work to achieve their own goals. They will manage the time, budget, and performance to meet the desired outcomes. These include the methodology of study and materials or supporters to assist them. In the end, the learner should understand how to evaluate what they have learned and reflect on the outcomes. The results should lead the learner to plan for the future and his/her life-long learning as Bruner's (1966: cited in Ma, 2017a) believed that this should be a great fundamental for knowledge development.

Several pieces of research collaborate on the self-directed learning theory in their instructional model.

Ramsiri (2013a) has researched the use of research-based learning in a secondary school where she also implemented the self-directed pedagogy in the instructional model. She argues that there are six steps in proceeding with the SDL.

1) The teacher facilitates students to discover needs
2) Goal setting
3) Empower and motivate students to learn through building knowledge, skills, and attitudes which enhance self-motivation in learning
4) Teachers and students collaboratively design the learning process
5) Students implement the learning process and the teacher supports the learning
6) Evaluation.

Recently years, as of the massive trend of technology consumption, Kim et al. (2014) have researched further how self-directed learning positively impacts online instruction and can lessen obstacles in learning. They designed the five tasks critical framework for the effective completion of self-directed learning which is online self-directed learning.

1) Establishing learning goals

2) Locate and access resources
3) Adopt and execute learning activities
4) Monitor and evaluate the performance
5) Reassess learning strategies progress

They developed the framework to assist students in online learning as they found students struggled with self-studying of isolation and self-discipline. The SLD framework then is proposed as a personalized system that students can use to manage and operate their learning performance. They adopted the use of Web 2.0 social technology application and MediaWiki within the self-directed learning framework to enable teachers and peers to collaborate, interact, give feedback, and support from a distance. This shows that the self-directed are majorly responsible by learners but need to be under an effective system. The components within the framework should also mention materials, resources, and interaction processes of learners and facilitators, not just learning by self solely (Kim et al., 2014).

Teevasutornsakul, Manosuttirit, and Itsanapong (2015) have developed a self-directed learning instruction model for the community to enhance the self-directed learning of the community college students and suggest that there are eight significant steps.

1) Teachers carry out an analysis and preparation
2) Teachers explain the details to students
3) Teachers inform learning subjects and objectives
4) Students design a learning plan
5) Students follow the learning plan
6) Summarize and examine the results of learning
7) Assess the results of learning
8) Analyze and improve learning

They additionally suggest that there are three conditions to assist self-directed learning: 1) Relevant principles/theories/models/teaching methods/etc., supporting self-directed learning can be properly applied 2) Teachers play a role in guiding and assisting students as necessary and appropriate, and 3) ICT enhancing self-directed learning can be accordingly utilized.

Aligned with Lubbe (2015a), who has studied the measuring tools of the level of self-directed readiness in learners, the essential abilities to support self-directed learning are as follows:

1) Students are able to identify and explain important underlying assumptions.
2) Students are able to apply the fundamental ideas to real-world issues or circumstances.
3) Students can construct basic models based on concepts.
4) Students may evaluate and contrast the costs and advantages of basic models, demonstrating why one is superior to the other (Dynan et al., 2008: cited in Lubbe, 2015a).

He further summarizes that there are five learners' capacities of self-directed readiness which are:

1) Viewing peers as resources

A self-directed learner should know how to seek assistance either from teachers or peers. Peers are seen as supporters who have unique contributions with both personal support and academic support.

2) Being able to give and receive help

This does not refer to only sharing personal issues but also accommodating each other. A student should be able to take the peer's opinion into account.

3) Developing good social skills

Connected to the previous skills, the student should be able to communicate without having conflict with others. He/she should know how to start the conversation and respond to increase motivation and curiosity including eagerness to communicate with others.

4) Being motivated to learn

Students are motivated in learning with an increase in curiosity.

5) Taking initiative and responsibility for learning

As a self-directed learner, a student is expected to initiate some ideas and show commitment to his/ her learning.

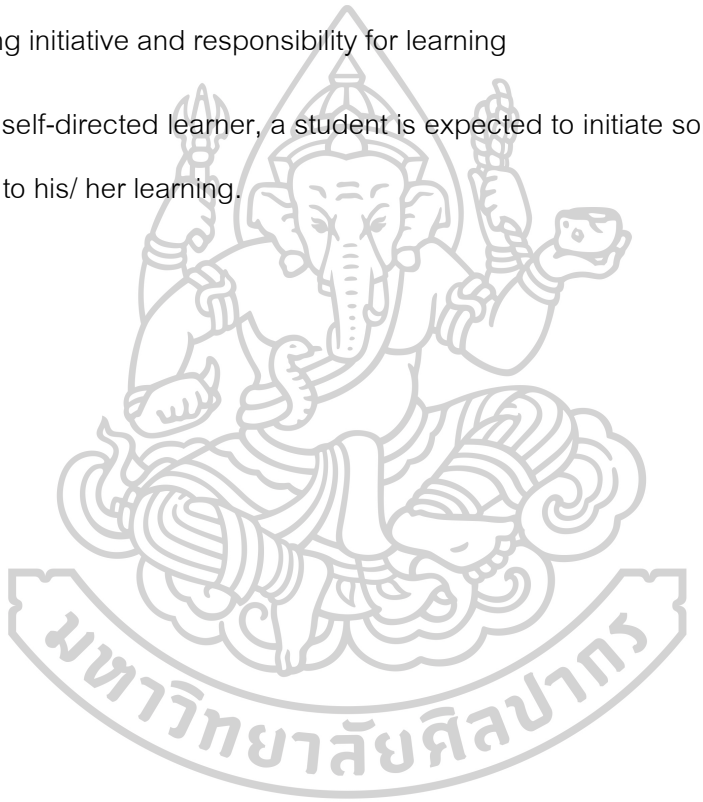


Table 6 The synthesis matrix of the self-directed learning processes

Knowles (1975)	Ramsiri (2013)	Kim et al. (2014)	Teevasutornsakul et al. (2015)	Ma (2017)	Researcher's summary
1.) Diagnose learning needs	1.) The teacher facilitates students to discover needs	1.) Establishing learning goals	1.) Teachers carry out an analysis and preparation	1.) Planning - Planning - Setting goals - Choose activities/ strategies	1.) Diagnose learning needs
2.) Specify learning objectives	2.) Goal setting				2.) Identify objectives
	3.) Empower and motivate students to learn		2.) Teachers explain the details to students		3.) Plan learning activities
3.) Specify learning resources and strategies	4.) Teacher and students collaboratively design the learning process		3.) Teachers inform learning subject and objectives		
4.) Specify evidence of accomplishment			4.) Students design a learning plan		
5.) Specify how the evidence will be validated					

Knowles (1975)	Ramsiri (2013)	Kim et al. (2014)	Teevasutornsakul et al. (2015)	Ma (2017)	Researcher's summary
6.) Review your contract with consultants	5.) Students implement the learning process and the teacher supports the learning	2.) Adopt and execute learning activities	5.) Students follow the learning plan	2.) Executing	4.) Implement and monitor the process
7.) Carry out the contract					
8.) Evaluation of your learning	6.) Evaluation	3.) Monitor and evaluate the performance	6.) Summarize and examine the results of learning	3.) Evaluating - summative evaluation - reflecting - planning for future	5.) Evaluate and reflect on learning
		4.) Reassess learning strategies progress	7.) Assess the results of learning		
			8.) Analyze and improve learning		

In summary, the researcher found that there are five major processes in self-directed learning which are:

1) Diagnose learning needs: The teacher chooses an appropriate leadership style to work with students to diagnose the learning need. The need should relevant and important for the learner and realistic within their social context. It should highlight the gap between the learner's current stage and the goal he/she wants to achieve which can be a personal desire or skill development.
2) Identify objectives: Students specify the objectives of the outcomes. The objectives should be the final outputs of what lastly will be achieved without specifying the methods of learning. The teacher should empower and motivate students to set goals in learning which enhances the self-motivation of students.
3) Plan learning activities: Students plan on what learning strategies or tools will work best to meet the objectives. They should specify learning resources, evidence of accomplishment, and how the evidence will be validated. Teachers and students can collaboratively design the planning process.
4) Implement and monitor the process: Students execute the plan and monitor their learning. They could ask peers or teachers or seek for experts to consult and give feedback on their learning. This can be done before, during, and after implementing the plan. While monitoring their learning, if the first idea does not work out, students should manage the stress and conflict and should not hesitate to adapt to the learning plan.
5) Evaluate and reflect on learning: Students can evaluate the outcomes in productivity and the learning process. In this stage, students should understand how they learn and what learning process affects their learning ability in particular ways. They should reflect on their learning and be able to plan for future usage.

In conclusion, self-directed learning mainly works by the learner which is driven by his/her motivation in learning. Teachers and peers are supportive resources to guide and facilitate the learner. The learner learns what is important to know and is an achievable goal in the current situation and can be useful in their future. The learner develops the metacognitive process while learning and know-how to learn which can be applied in other particular situations. Lastly, the learner can evaluate his/her learning to identify what is the best learning methodologies that suit the learner the most.

It shows that the significant idea of using self-directed learning is not just the outcomes of whether the learner can solve the particular issues or achieve their goals at the time, but it'd rather reflect the learner's ability to learn how to learn. It focuses on the progress of learning more than the outcome. Many educators and researchers (Laoriendee, 2011; Panich, 2012), in the 21st century, learning to learn and sustainable learning are essential skills. Content-based learning or subject matter learning should be the responsibility of students by having a teacher as a facilitator. Peers and teachers are supportive resources that empower students in learning. The teacher should design activities to scaffold students to discover themselves and evaluate their learning methodology. Hence, students must know how to think, critically think, learn, continually learn, solve problems, communicate, work cooperatively with others, and live their lives efficiently and effectively. These truly connect to the idea of sustainable development. It is aligned firmly with the concepts studied by various educators that self-directed learning shared the same properties which are; "it is a process, learners take initiative, learners formulate learning goals/ outcomes; learners take responsibility, learners select learning strategies; learners evaluate learning experiences and outcomes/goals; learners do not work in isolation" (Lubbe, 2015b).

2.3.2. Issue-Based Learning

Issue-based learning is the name of problem-based learning (PBL) which was introduced in the early 1990s by the School of Social Work at the University of New

South Wales to replace the PBL to reflect the placement in social work course more (Bolzan & Heycox, 1997). The issue-based or PBL is the learning approach that emphasizes how students learn to learn so they can solve problems whilst the problems are meaningful and important to learners. The learners can enhance their creative thinking, analytical thinking, skills to acquire further knowledge, and learning processes through motivational desire to solve the problems, self-directed, and self-assessed behavior. Moreover, it is found that PBL also affects the application of knowledge and long-term knowledge retention (Goh & Yew, 2016; Green & Price, 2019; Ramsiri, 2013a). This entails inviting students to discuss and share their ideas on a topic connected to the learning subject. Students should be able to ask questions, share their thoughts on the learning assignment, and communicate with their peers using the learning management system. They may engage in more reflective thinking, communicate more information, and conduct independent research in this circumstance. It can assist pupils in constructing social knowledge among group members. Students might become engrossed in collaborative learning, critical thinking processes, and social connections while participating in such issue-based discussion activities (Lai & Hwang, 2015).

Furthermore, the PBL is found to have vast effectiveness in Business Studies compared to other disciplines (Kwan, 2009). It is found that the PBL often centers on efficiency issues and students' perceptions linked to extrinsic motivation. In the book “Teaching and Learning at Business Schools: Transforming Business Education” by Mårtensson and Bild (2016: 177), for activity planning for a business program design, issue-based learning helps students explore managerial issues important to Business studies such as branding, innovation, globalization, entrepreneurship, and various skill managements. It is aligned with Butchiwan (2016), who has researched “Problem-based learning: An Identification of self-sufficiency Business Plan to compare the academic achievement of students with the principles of a business plan by using problems – based learning”. In this research, it is found that students have an increased ability to

analyze the issues, and business plans by using an issue-based approach. The developed abilities are strategic and administration planning, Marketing planning, production, and operational planning, and financial planning.

Pyykkönen and Kalliomaa (2013) have researched “PBL Applications in the BBA Program in Business Administration in the School of Business and Services Management at JAMK University of Applied Sciences, Finland”. They introduce the PBL steps as 6 steps which are:

1) Brainstorming, mind maps, and Ideas.
2) Classification of ideas
3) Choosing and designing the problem areas and defining the learning task(s)
4) Individual processing of the problem by using new knowledge and new theories
5) Collaborative problem solving
6) Presentation of the group report and assessment by students

Ramsiri (2013a) has researched “problem-based learning to develop the Science Instructional Model by Using Research-based to Enhance the Research Skills, Creative Problem-Solving Skills, and Scientific Minds of Secondary School Students”. She has studied the concepts from various educators and synthesized the problem-based learning into 5 stages which are:

1) Explore the issue
2) Understand the problem
3) Plan and implement the problem solving
4) Present the solution
5) Evaluate the group work

It is suggested that the PBL helps support and empower problem-solving skills that learners can further apply in working and lifelong living. The PBL can increase the experience that is meaningful and useful to apply in various situations, especially in a

real-world application. It also supports the learners to develop their working progress to maximum efficiency (Ramsiri, 2013a).

Khanthasiri et al. (2015) have researched “the use of inquiry and socioscientific issue-based approaches to promote learning achievement, science literacy, and decision-making for Prathomsueksa VI students”. They introduce the socioscientific issue-based approaches in 6 steps which are:

1) The search problem (Explore the issue)
2) Grouping and priority (Classify and prioritize the issue)
3) The analysis of content (Analyze the issue)
4) Planning to solve issues (Plan the solutions)
5) The experiences and learning (Design learning experiences)
6) Evaluate (Evaluate results)

Prasertsuk (2016) has researched “The Development of Problem-Based Learning to Promote Critical Thinking of Students at Upper Secondary Educational Level” In the research, it suggests that there are 6 steps of problem-based learning to promote critical thinking for the upper secondary school level students which are:

1) Identify the problem: It is the step that a teacher uses data collected from articles, news, or current issues in daily life to encourage students to aware of problems. Thus, they can identify the problems in which they are interested to find answers or solutions.
2) Understand the problem: It is the step that the students will need to understand the problem by being able to identify the main ideas, causes, or contexts relevant to the problem.
3) Study problem: It is the step that students collaboratively plan on researching by being able to identify the research topics, research methods, and learning resources on their own.

4) Analyze knowledge: It is the step in which students interpret, evaluate, and assess the validity of the collected data to find reasonable conclusions.

5) Summarize and evaluate answers: It is the step in which the students summarize the learning results within their groups and each group member evaluates the answer before presenting it to others.

1) Present and evaluate results

It is the step in which students organize their findings to present in various methods and teachers and students evaluate the results together.

In summary, issue-based learning, or PBL is a teaching approach in which students explore real-life issues of concern to themselves. This encourages students to use higher-order thinking including reflective thinking through an active and participatory approach in which students can share their perspectives along with listening to others. The researcher has synthesized the issue-based learning steps into six steps.

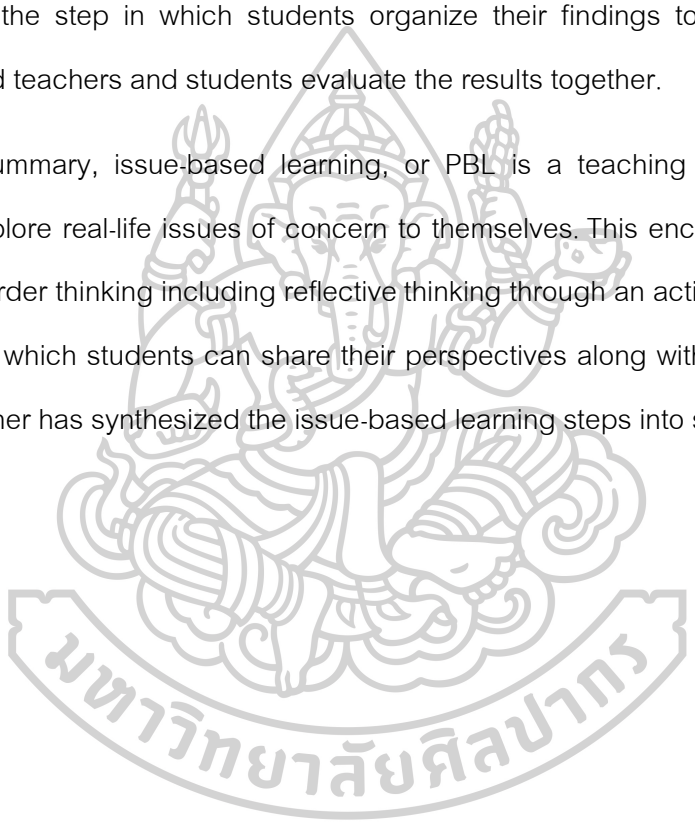


Table 7 The synthesis matrix of issue-based learning processes

Pyykkönen and Kalliomaa (2013)	Ramsiri (2013a)	Khanthasiri et al. (2015)	Prasertsuk (2016)	Researcher's summary
1) Brainstorming	1) Explore the issue	1) The search problem	1) Identify problem	1) Explore and prioritize the issues
2) Classification of the ideas		2) Grouping and priority		
3) Defining the problem and the learning task	2) Understand the problem		2) Understand the problem	2) Understand the problem
			3) Study problem	
	3) Plan and implement the problem solving	3) The analysis of content	4) Analyze knowledge	3) Identify the learning tasks and plans
4) Individual processing		4) Planning to solve issues		4) Implement the plan and learn
5) Solving the problem		5) The experiences and learning		
6) Presentation	4) Present the solution	6) Evaluate	5) Summarize and evaluate answers	5) Summarize and present the solution
	5) Evaluate the group work		6) Present and evaluate results	6) Evaluate results

The researcher synthesized the issue-based learning into 6 steps which are

1) Explore and prioritize the issues

In this stage, the students explore the issues by brainstorming, searching, classifying, and prioritizing the issues.

2) Understand the problem

In this stage, the students define the problems which are the main ideas, causes, or contexts. The students should research to identify the research topics, research methods, and learning resources on their own.

3) Identify the learning tasks and plans

In this stage, the students define the learning task. They must analyze the collected content and knowledge to plan how they should do to find reasonable conclusions

4) Implement the plan and learn

In this stage, the students process their plans to solve issues and monitor how they experience and learn while implementing the plans.

5) Summarize and present the solution

In this stage, the students summarize the learning results within their groups and each group member evaluates the answer before presenting it to others.

6) Evaluate results

In this stage, the students and teachers evaluate the final results or solutions that have been discussed with their groups already.

To summarize, the constructivist instructional model using self-directed learning and issue-based learning to empower ESL learners' education for sustainable development in Business Studies for international high school students in Thailand has 7 steps which are called the "EDIIIS" model as followed.

Table 8 The synthesized instructional model of self-directed learning and issue-based learning

Self-directed Learning	Issue-based learning	Researcher's summary
Diagnose learning needs	Explore and prioritize the issues	Explore the issues
	Understand the problem	Diagnose learning needs
Identify objectives	Identify the learning tasks and plans	Identify objectives
Plan learning activities		Identify the learning tasks and plans
Implement and monitor the process	Implement the plan and learn	Implement the plan and monitor the process
Evaluate and reflect on learning	Summarize and present the solution	Summarize and evaluate the results
	Evaluate results	

The researcher has synthesized the linked concepts of self-directed learning and issue-based learning which can be explained as follows.

1) Explore the issues

A teacher teaches the fundamental concepts of the learning subject to assist students to explore the issues. Students should brainstorm and prioritize the issues to find what issue is more important to them as a part of a community.

2) Diagnose the learning needs

The teacher motivates students to diagnose the learning need. The need should relevant and important for the learner and realistic within their social context. It should highlight the gap between the learner's current stage and the goal he/she wants to achieve which can be a personal desire or skill development.

3) Identify the learning objectives

Students specify the objectives of the outcomes. The objectives should be the final outputs of what lastly will be achieved without specifying the methods of learning. The teacher should empower and motivate students to set goals in learning which enhances the self-motivation of students.

4) Identify the learning tasks and plans

Students identify the learning task and strategies for each objective. How they propose to accomplish each of them. Students should identify the pieces of evidence, which could be both material objects and human resources that need to be collected to indicate the degree to which students achieved each objective. The verification needs to be provided to specify the specific method of evidence usage in judging each criterion. The learner specifies from the type of objectives that what criteria will vary. Then, students plan on what learning strategies or tools will work best to meet the objectives. They should specify learning resources, evidence of accomplishment, and how the evidence will be validated. Teachers and students can collaboratively design the planning process.

5) Implement the plan and monitor the process

Students execute the plan and monitor their learning. They could ask peers or teachers or seek for experts to consult and give feedback on their learning. This can be done before, during, and after implementing the plan. While monitoring their learning, if

the first idea does not work out, students should manage the stress and conflict and should not hesitate to adapt to the learning plan.

6) Summarize and evaluate the results

Students summarize the solution and evaluate the outcomes in the productivity and learning process. In this stage, students should understand how they learn and what learning process affects their learning ability in particular ways. Students evaluate their learning both for meeting learning goals and their learning processes. Furthermore, students should be able to suggest, recommend, or plan for future usage.

In summary, the synthesis of the self-directed learning process and the issue-based learning process results in the new learning process known as EDIIIS, which has six steps. The invented process has the potential to improve ESD skills. The following section presents the ESD concept and skills which are used to study the effectiveness of the model in the research.

2.4. Education for Sustainable Development

UNESCOBANGKOKOFFICE (2019) defines the concept of the Education of Sustainable Development or ESD on its website that it is an educational goal to empower learners to:

> *"…take informed decisions and responsible actions for environmental integrity, economic viability, and just society, for present and future generations, while respecting cultural diversity. It is about lifelong learning and is an integral part of quality education. ESD is holistic and transformational education that addresses learning content and outcomes, pedagogy, and the learning environment. It achieves its purpose by transforming society."*

This demonstrates ESD's objective of emphasizing learning in an interconnected environment. Students are required to be able to recognize and act in order to achieve the goal of a sustainable future.

McKeown (2002), who attended the United Nations (UN) Commission on Sustainable Development (CSD) in 1998, has interested in developing a toolkit for ESD. She found a variety of uses in terms related to ESD such as Sustainable Education (SE), Education for Sustainability (EfS), or Education to Sustainable Development (ETSD). However, the most agreed terminology used internationally is the Education for Sustainable Development (ESD) which was frequently stated in several UN reports. It was defined as the development in responding to nowadays' needs and situations which refers to the progress of balancing the current statement with the future quality of life. Meanwhile, there is some confusion about whether it is referred to "the education for sustainable development (an awareness lesson or theoretical discussion)" or "sustainable development education (the use of education as a tool to achieve sustainability)". McKeown (2002) has found the integration in them and raised that education is a major key to driving sustainable development in several areas.

From the UN roadmaps sustainability was focused on three main areas: social, economic, and environmental issues. The three pillars of sustainable development are cited for the first time at the World Summit on Sustainable Development in Johannesburg in 2002. However, to influence the interactions of the three pillars, the political and cultural dimensions are identified as key dimension that facilitates the balanced progress of sustainable development.

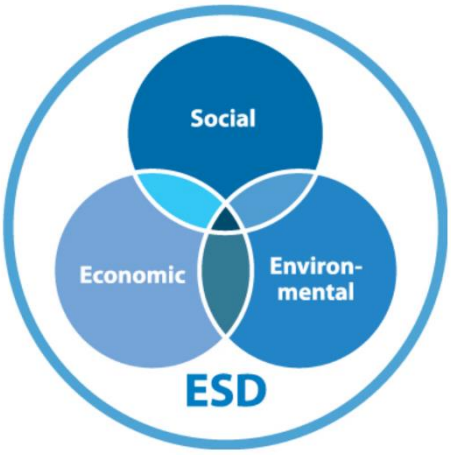


Figure 8 The three pillars of sustainable development conceptual core of the integration framework

Source: esd.bgk. (2019). Understanding ESD. Retrieved from ESDteachers: https://esdteachers.bangkok.unesco.org/?p=505

The Implementation of ESD in curriculum

McKeown (2002) discovered that education had a direct impact on sustainability plans in three areas: implementation, decision making, and quality of life. By beginning to implement the ESD into an educational system, there are four priorities to be addressed.

1) Improving basic education

It is suggested that only improving basic literacy will not lead to sustainable development. This is quite mainstream in most countries where basic education only allows learners to use their lower-order thinking. Truly sustainable learning should instead develop critical thinking skills, skills, organizing and interpreting skills, skills to formulate questions, and analyzing skills towards issues that confront communities.

2) Reorienting existing education

Curriculums come in a variety of forms, but the most common are formal, nonformal, and informal education. The formal curriculum is thought to emphasize five

criteria for addressing sustainability in schools: knowledge, skills, perspectives, values, and issues.

3) Public understanding and awareness

The more usage of technologies and media, the more education should strengthen the learners' literacy. Living in today's society has brought attention to public awareness to make sure that the population in a country has the same goals in developing sustainability. Well-literature citizens seem to help the government achieve its goals easier.

4) Training

As education brings in knowledge, the training should better emphasize performing specific tasks. The training should be taught in the circumstances where a person is required to complete a non-skilled action. This would enhance higher skills and lead to the sustainable development of individuals.

Principles of ESD

According to McKeown (2002), the ESD emphasizes the learners' lifelong education which shows applicability in real-life situations depending on community contexts. The learners should have practical skills to enable them to live sustainable life as effective adults. The essential skills are demonstrated below.

1) The capacity to communicate effectively (both orally and in writing).
2) The capacity to think about natural and social scientific systems.
3) The capacity to think in terms of time - to foresee, plan, and think forward.
4) The capacity to consider value concerns critically.
5) The capacity to distinguish between numbers, quantity, quality, and value.
6) The capacity to transition from awareness to knowledge to action.
7) The capacity to work together with others.

8) The capacity to use multi methods to learn and solve issues such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing.
9) The capacity to to produce an aesthetic response to one's surroundings

These skills fall into the three main goals in social, economic, and environmental issues that aim to enhance learners' skills in managing and interacting with the local environment. The skills have been revisited in the UNESCO meeting in the year 2005 when the UN declared the goal for the decade of 2005-2014 as the "UN Decade of Education for Sustainable Development (DESD)". They suggested that the principles of ESD are categorized into 6 principles: 1) Interdisciplinary and based on systems thinking 2) Values-driven 3) Critical thinking and problem solving 4) Multimethods 5) Participatory decision making, and 6) Locally relevant, effective, and contextual (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015).

Table 9 Principles and Characteristics of ESD

Principles	Characteristics
Interdisciplinary and based on systems thinking	Learning about sustainable development is not a distinct subject, but rather a component of the overall activities, curriculum, research, and management of campus initiatives
Values-driven	Sharing the ideas and values that support long-term growth
Critical thinking and problem solving	Increasing courage in dealing with long-term development challenges and obstacles
Multi methods	Learning processes are modeled by art, discussion, theatre, recreational experiences, various pedagogies, and so on
Participatory decision making	Involving the learners' role in making decisions about their learning

Locally relevant, effective, and contextual	Using the languages that students are most acquainted with and emphasizing both local and global concerns

In the year 2009, three practitioners had reflected on their experiments (Raufflet et al., 2009). The aim was to explore ways to build the classroom environment to empower business and economics students in their universities in two countries; France and Canada to become global citizens under sustainable development awareness. They mentioned five skills for the education for sustainable development which are:

1) Envisioning – It is how a learner can imagine a better future possibility which means the students should recognize how to achieve their goal easily if they have a clear idea about the goal.
2) Critical thinking and reflection – It is how a learner can question the present issues and recognize the assumptions underpinning society's views, attitudes, and understanding. It allows the learner to assess any issues about cultural structures, social, environmental, and economic in the perspective of long-term development.
3) Systemic thinking – It is how a learner may see complexities and explore linkages and synergies when trying to solve difficulties.
4) Building partnerships – It is how a learner promotes conversation and negotiation, as well as learning to collaborate
5) Participatory decision-making – It is how a learner empowers various persons and groups.

In the year 2017, UNESCO further introduced the eight competencies of ESD which are as follows (UNESCO, 2017).

1) Systems thinking - the ability to perceive and comprehend linkages; evaluate complex systems; consider how systems are integrated within diverse scales and domains, and cope with uncertainties.

2) Anticipatory - ability to comprehend and analyze many possibilities - feasible, likely, and desirable; to envision one's future; to adopt the scientific method; to assess the implications of actions, and to deal with uncertainties and transitions.
3) Normative - the ability to comprehend and reflect on the values and norms that guide one's behavior; and to discuss sustainable principles, values, objectives, and goals in the face of opposing demands and exchange, unclear information, and inconsistencies.
4) Strategic - the ability to create and implement new measures that promote sustainability at the local and global levels.
5) Collaboration - the abilities to learn from others; to comprehend and value others' interests, viewpoints, and acts (compassion); to comprehend, respond to, and be empathetic to everybody else (empathic leadership); to cope with group problems, and to promote participatory and collaborative problem-solving.
6) Critical thinking - the ability to challenge conventions, behaviors, and beliefs; to reflect on one's values, views, and behaviors; and to participate in the sustainability discourse.
7) Self-awareness competency: the ability to consider one's position in the local community and global nation; to constantly assess and encourage one's behavior; and to cope with one's thoughts and wants
8) Integrated problem-solving competency: the ability to use various problem-solving frameworks to difficult sustainability challenges and produce equitable, inclusive, and viable solution alternatives that promote sustainable development, while combining the aforementioned abilities

The eight competencies of ESD can be divided into three domains which are 1) cognitive domain (knowledge and thinking abilities) 2) socio-emotional domain (social abilities), and 3) behavioral domain (action competencies) (Taimur & Sattar, 2019) (see *Figure 9*). The key competencies in a three-domain show that they are fundamental skills

to build other skills in ESD as shown in the embedded relationship. The cognitive competencies are seen to be important skills to drive other competencies in socio-emotional and behavioral domains.

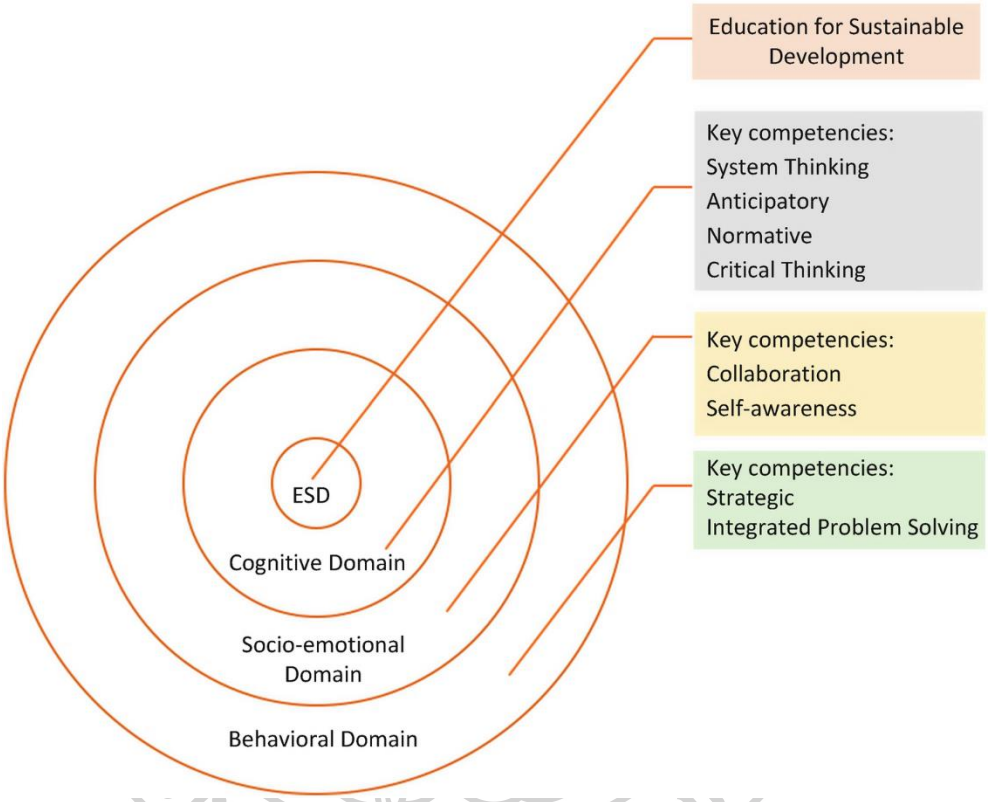


Figure 9 Key competencies in ESD arranged in a three-domain framework

Source: Taimur, S., & Sattar, H. (2019)

Payutto (2018) has introduced the concept of ESD in Buddhism belief. Thailand is considered “the world's most heavily Buddhist country” where approximately 93.6 percent of the population are Buddhists ("Buddhism and Religion in Thailand," 2019). He focuses on the development of sustainability in the view of the need for the right development in long term. In the past, development mostly refers to the building of an economy, technology, and civilization among the population in the country.

The problem is that it only works in short term and becomes unsustainable development. The more advanced technology and civilization a country has, the less nature and awareness are. It affects two major ways of living; firstly, technologies are built from natural resources. People destroy more of nature and replace it with unsustainable materials that could not be rebuilt; secondly, it creates fault wants among the population and only serve short-term happiness rather than long-term sustainability. Hence, to develop sustainability, both human and natural development have to work collaboratively. Payutto (2018) argues that human development is the integrated core within the holistic development of all systems.

The human development principles are behavior, mind, and wisdom which perfectly fall into the Buddhist's threefold training or Triśikṣā; śīla (moral conduct), samādhi (meditation), and paññā (wisdom) (Payutto, 2018).

1) Virtue (Behavior development)

A person should act appropriately and not infringe on the rights of others. The behavior, including normal behavior, should be creative and positive to others. A person must consistently behave nicely so that it becomes ingrained in his or her way of life. It also encourages working behavior by making one aware of one's role in the community. The action would not infringe on the rights of others or the environment. The primary goal of the job is to persevere as a supportive living factor in positive outcomes. Regardless, consumption behavior is required for a healthy economy. As a customer, one should consume only to meet one's own needs, which should not degrade one's quality of life. They can act in ways that promote their happiness and self-development. Overall, it implies that a person balances their behavior to self-satisfy for their interests, but must not put himself/herself in danger or harm nature or others.

2) Concentration (Mind development)

This refers to a commitment to act and behave in a way that promotes sustainable development. A person should be able to coexist peacefully and effectively

with nature. The mind is conditioned to think optimistically, creatively, and sustainably to develop self-awareness and community awareness. A person should have a clear goal, vision, and dedication to thinking, living, and assessing life's needs.

3) Wisdom (Wisdom development)

Metacognition is a solution to balancing behavior and the mind. The wisdom will adjust and balance the quality of life to freedom and peace. A person should think critically and reasonably in both qualitative and quantitative approaches. The wisdom will lead a person to live smartly and be able to justify the true value of things.

A system of sustainable development is another part relevant to human development as a holistic purpose. Payutto (2018) argues that there are four principles in developing the system which are human development, social development, nature development, and technology development.

In total, the researcher found some correlation between some skills provided by different researchers which can be explained into 5 sustainable development skills as shown in table 10.

1) Self-awareness
2) Systems thinking
3) Critical thinking
4) Integrated problem-solving
5) Collaboration

Table 10 A Synthesis matrix of sustainable development skills

McKeown (2002)	*UNESCO, 2005, 2012: cited in Juárez-Nájera (2015)*	Raufflet et al. (2009)	UNESCO (2017)	Payutto (2018)	Researcher's summary
Transition from awareness to knowledge to action.	Values-driven	Envisioning	Self-awareness	Mind development	Self-awareness
Distinguish between numbers, quantity, quality, and value.			Anticipatory competency		
Think in terms of time			Normative competency		
Think about natural and social scientific systems.	Interdisciplinary and based on systems thinking	Systems thinking	Systems thinking competency	Wisdom development	Systems thinking
Consider value concerns critically	Critical thinking and problem solving	Critical Thinking and Reflection	Critical thinking		Critical thinking
			Integrated problem-solving		Integrated problem-solving
Use multi methods to learn and solve issues	Multi methods		Strategic		
	Locally relevant				

McKeown (2002)	*UNESCO, 2005, 2012: cited in Juárez-Nájera (2015)*	Raufflet et al. (2009)	UNESCO (2017)	Payutto (2018)	Researcher's summary
Work together with others	Participatory decision making	Participatory decision-making	Collaboration	Behavior development	Collaboration
Communicate effectively		Building partnership			
Produce an aesthetic response to one's surroundings.					

As synthesized, the 5 ESD skills are essential to learners for solving sustainable issues. They are studied further to find the concepts, tools, and practices to ensure the effectiveness of the development and implementation of the instructional model to empower the skills.

2.4.1. Self-awareness

Many practitioners from various fields of study have studied self-awareness. Self-awareness is one of several key self-related concepts that focuses on the ability to reflect perceived experiences within a multidimensional phenomenon.

2.4.1.1. Self-awareness concepts

Morin (2011), a researcher who studies the definition, measures, effects, functions, and antecedents of self-awareness, defines it as the ability to think about personality traits, goals, emotions, attitudes, preferences, intention, and so on all at the same time. It differs from consciousness in that it only perceives and processes stimuli from one's surroundings while being aware of one's actions. It progresses from unconsciousness to consciousness to self-awareness and can be expanded to meta-self-awareness (to be aware that you are self-aware).

Table 11 Four levels of consciousness

Levels Definition	Levels Definition
1 – Unconsciousness	Being unresponsive to oneself and one's surroundings
2 – Consciousness	Concentrating one's attention on the surroundings; function of the environmental forces
3 – Self-awareness	Concentrating one's interest on oneself; processing personal and public conscience
4 – Meta-self-awareness	Being aware of one's own self-awareness

According to the research, UNESCO (2017) identifies the key competencies for long-term sustainability Self-awareness is one key. It is defined as "the ability to reflect on one's own role in the local community and (global) society; to constantly evaluate and motivate one's actions, and to deal with one's feelings and desires." This concept arose from the competencies developed between 2005 and 2012, which were solely focused on the value-driven definition. However, it demonstrates that to meet the ESD today, we must be able to be aware of personal goals that also share common values within society. It addresses the individual's role as a local, community, and global citizen. The awareness should be linked to personal motivation and evaluated regularly to grow sustainably. This links to the concepts from McKeown (2002), who demonstrate that an ESD learner should be able to move from awareness to knowledge to action, as well as be able to think of the time in the present to plan for the future. According to Raufflet et al. (2009), it is also the premise to set a goal for the self-relevant future and to see the vision clearly to achieve it. The concepts are related to anticipatory competency and normative competency, which enable an individual to understand and evaluate oneself to set valuable goals and actions (UNESCO, 2017). Furthermore, in Buddhism, mind development for sustainable development refers to individual self-commitment as well as an awareness of community value (Payutto, 2018). Table 11 displays the concepts brought forward by the researchers that can be synthesized into self-awareness concepts in ESD.

Table 12 The summary of self-awareness concepts in ESD

McKeown (2002)	*UNESCO, 2005, 2012: cited in Juárez-Nájera (2015)*	Raufflet et al. (2009)	UNESCO (2017)	Payutto (2018)
The capacity to transition from awareness to knowledge to action.	**Values-driven** is sharing the ideas and values that support long-term growth	**Envisioning** is how a learner can imagine a better future possibility which means the students should recognize how to achieve their goal easily if they have a clear idea about the goal.	**Self-awareness** is the ability to consider one's position in the local community and global nation; to constantly assess and encourage one's behavior, and to cope with one's thoughts and wants	**Mind Development** is a commitment to act and behave in sustainable development. A person should live happily and effectively with nature. The mind is tending to be controlled to think optimistically, creatively, and sustainably for developing self together with community awareness. A person should have a good goal, vision, and commitment to thinking, living, and assessing the needs of life.
The ability to think in terms of time - to foresee, plan, and think forward.			**Anticipatory competency** is the ability to comprehend and analyze many possibilities - feasible, likely, and desirable; to envision one's future; to adopt the scientific method; to assess the implications of actions, and to deal with uncertainties and transitions.	
The ability to distinguish between numbers, quantity, quality, and value.			**Normative competency**: the ability to comprehend and reflect on the values and norms that guide one's behavior; and to discuss sustainable principles, values, objectives, and goals in the face of opposing demands and exchange, unclear information, and inconsistencies.	

To summarize, self-awareness is the ability to reflect perceived experiences within a multidimensional phenomenon while also being aware of personality traits, goals, emotions, attitudes, preferences, intentions, and so on to move to action in the future. To synthesize various concepts, self-awareness in ESD addresses reflection on one's role in a community that shares the values and principles that underpin sustainable development and society to set visions and plans for the future. To meet the criteria for self-awareness in ESD, a person must meet the following criteria.

1) The ability to be aware of one's need by reflecting on his/her role in society
2) The ability to create a clear and valuable vision, and plan for the future
3) The ability to move from awareness to knowledge to action.
4) The ability to evaluate and assess the consequences of actions to deal with conflicts and changes

2.4.1.2. Self-awareness assessment

Clawson et al. (1985) propose using the deductive approach to assess self-awareness in their self-awareness assessment (SAA). It should begin with a basic question such as "Who am I?" and progress to what you know about yourself before concluding yourself. The majority of questions will begin with the word "How," such as "How do I think?" What words do others use to describe me? The tool also employs a rating scale to assess oneself across multiple dimensions. Ashley and Reiter-Palmon (2012), who has studied the self-awareness and the evolution of leaders, have suggested a better measure of self-awareness by using a rating scale with four dimensions. There is acknowledgement of external and internal requirements, acknowledgement of one's negative and positive character traits, willingness for insightful and self-reflective notion, and willingness for detecting various gaps in

personal decisions, attributes, and achievement progress. These measurements are centered on leadership because it asserts that self-awareness is clearly linked to great leaders.

Morin (2011) researched the core self-awareness measurement tools and manipulations from various resources such as Self-focusing stimuli (mirrors, cameras, audience, voice recording) from Duval & Wicklund (1972: cited in Morin, 2011), Self-Consciousness Scale (Fenigstein et al., 1975: cited in Morin, 2011), Self-reflection/ Self-rumination scales (Trapnell & Campbell, 1999: cited in Morin, 2011), and so on. He found that the self-awareness inducing self-focus would lead to self-evaluation, then self-criticism might occur. An individual might compare self with others which can lead to negative criticism of self, which he or she will escape, or a positive outcome, in which the person will change self to focus on real self or change standard when focusing on an ideal self. The assessment should focus on the "How" question to recall, reactivate, and allow the self to communicating with itself.

As an individual becomes more self-aware, it can help propel him or her into a sustainable, self-sufficient future. According to Zaffiro et al. (2020a), self-awareness would lead to the recognition of diversity and trust, both of which are important components of the group's adaptive capacity. They discovered that self-awareness helps sustainability practitioners in real-world situations, in their leadership development, and the effectiveness of their work. According to their research synthesis, self-awareness to meet sustainability is shown within three themes: 1) Dealing with complexity 2) Examining one's role and responsibilities; and 3) Recognizing the significance of interpersonal factors.

To summarize, the tool should focus on making an individual aware of their statements, reflective thoughts toward self-relevant to sustainable goals, and evaluating self to be able to set goal process so they can fully commit to their goal with motivation.

2.4.1.3. Self-awareness practices

ASCD suggests that students with strong self-awareness skills should be able to (Lopez, 2017):

1) Consider the needs of peers in certain academic fields who may be struggling
2) Respect other people's cultural and religious beliefs in the classroom
3) Focus on and communicate how others may be influenced by their actions and words
4) Demonstrate an ability to understand and convey their feelings
5) Use self-instruction to address social or academic issues
6) Define what they need to learn to effectively accomplish individual or group assignments.
7) Understand their strengths and weaknesses

Zaffiro et al. (2020a) discovered some practices for increasing self-awareness. There are three domains based on 35 different practices among 15 interviewees: mind, body, and mind and body. An individual should practice the following practices in three major clusters: 1) Presence 2) Self-reflection; and 3) Group reflection. Presence is the awareness of the present moment in which an individual should practice focusing on being in the present moment, diminishing attention given to thoughts about the past or future, and ensuring concentration and receptivity. Learning to ground the body while stilling thoughts from the mind is essential. Self-reflection is the process of learning about one's actions, behaviors, personality, and thoughts. Introspections, specific frameworks for reflection, and journaling can all be used to track this. Finally, collective

reflection entails the goal of learning about one's actions, behaviors, character, and thoughts by reflecting on the ideas of more than one person. Individuals can improve their collective reflection by participating in group activities, soliciting feedback, and engaging in reflective or exploratory conversations. Furthermore, some practices, such as adopting a particular mindset or perspective by viewing oneself as a part of larger systems, and meditation, are recommended. This relates to some advice gleaned from the interviewees' research. The six suggestions below would be beneficial to less experienced professionals.

1) Keeping an attitude of learning is about getting to know oneself either from self-reflection or learning from others.
2) Nurturing a relationship with yourself is about responding to feelings and emotions, and self-care.
3) Knowing where you operate comes from being aware of the source of action and creating attributes from passions that are related to determination.
4) Engaging in personal practices is about practices related to presence while integrating with someone else or with self.
5) Finding your way is about the differentiation that one aware that everyone has a unique way to improve themselves.
6) Knowing your limitations means being aware of the boundaries and limitations that allow a person to accept and deal with nurture. This includes being aware of their own biases as well as knowing when to seek help from others.

In conclusion, practicing the mind, body, and mind-body together can improve a student's self-awareness in ESD. He or she can concentrate on valuable self-reflection or the reflections of others. The mind should concentrate on the present moment to set goals that are important to both oneself and others. At the same time, to achieve the

goals, he or she must first understand one's strengths, weaknesses, and limitations to develop action plans and know when to seek assistance.

2.4.2. Systems thinking

Systems thinking is an essential skill in ESD. It helps students empower their higher-order thinking to help them understand the complexities and dynamics of the three key dimensions of ESD: natural, social, and economic systems. Individuals with this ability can actively participate in sustainable development because they have a comprehensive understanding of the global relations system (Schuler, Fanta, Rosenkränzer, & Rieß, 2018; Thornton, Peltier, & Perreault, 2004).

2.4.2.1. Systems thinking concepts

Zaffiro et al. (2020a) interpret systems thinking as how a person sees the big picture of a whole system which can be complex. As a result, systems thinking would assist the individual in dealing with complexity by providing a greater grasp of the dynamic interactions and feedback loops that define complex adaptive systems. Nevertheless, Boersma et al. (2011: cited in Fraune, 2013) suggest that, at the secondary school level, instilling systems thinking in a primary would empower cognitive structures relevant to systems concepts such as part-whole relation, form-function relation, and casualty. It can aid in the development of higher-order thinking skills.

According to previous research, UNESCO (2017) defined systems thinking competence as the capacity to perceive and comprehend linkages, assess complex systems, examine how systems are embedded within diverse domains and scales, and cope with uncertainty. It demonstrates that a person should be able to view the big picture as a whole, although if it is complex. However, the individual must be aware of the complexities and be able to deal with them. The idea is similar to UNESCO, 2005, 2012: cited in Juárez-Nájera (2015) concept of interdisciplinary and based on systems thinking. It also addresses the capability to see the whole system concerning sustainable

development. Moreover, McKeown (2002) and Raufflet et al. (2009) argue that systems thinking competency is important because it allows a person to understand the complex relationships in systems embedded as wholes and deal with uncertainty. The concepts can be linked to Payutto's (2018) wisdom development, which focuses on acknowledging and balancing behavior and mind. To deal with uncertainty, it suggests that the person adjusts and balances their thinking and action. The table below summarizes the concepts introduced by the researchers that can be synthesized into systems thinking concepts in ESD.

Table 13 The summary of systems thinking concepts in ESD

McKeown (2002)	*UNESCO, 2005, 2012: cited in Juárez-Nájera (2015)*	Raufflet et al. (2009)	UNESCO (2017)	Payutto (2018)
The capacity to think about natural and social scientific systems.	**Interdisciplinary and based on systems thinking** is learning about sustainable development is not a distinct subject, but rather a component of the overall activities, curriculum, research, and management of campus initiatives	**Systems thinking** is how a learner may see complexities and explore linkages and synergies when trying to solve difficulties.	**Systems thinking competency** is the ability to perceive and comprehend linkages; evaluate complex systems; consider how systems are integrated within diverse scales and domains, and cope with uncertainties.	**Wisdom development** is metacognition which is a solution to balancing behavior and mind. The wisdom will adjust and balance the quality of life to freedom and peace. A person should think critically and reasonably in both qualitative and quantitative approaches. The wisdom will lead a person to live smartly and be able to justify the true value of things.

To summarize, systems thinking generally refers to the capacity to see the big picture of a whole system in complex relationships and understand the interconnections and control loops that define large adaptive systems. To synthesize various concepts, systems thinking in ESD addresses how a person recognizes, links, and synergizes embedded relationships while finding the solutions to problems. To fulfill the systems thinking in ESD, a person should meet the following criteria.

1) The ability to recognize and understand relationships in a whole picture
2) The ability to analyze and synthesize embedded relationships among them

2.4.2.2. Systems thinking assessment

Fraune (2013) has researched modeling systems thinking for students including assessment, structure validation, and model development. The researcher focuses on assessing systems thinking through different concept-mapping practices. Among various assessment approaches such as interviews, classroom discussion, and questionnaires, the study suggests that concept mapping is an adequate tool for the systems thinking assessment to understand the relationship in the whole system as cause-and-effect-loop related.

The CM represents the mental model to evaluate conceptual understanding and also helps to solve a problem in complex systems (Johnson-Laird, 2001: cited in Fraune, 2013). The directedness of the mapping (high directed vs. non-directed) does not affect student performance. However, if a student has a tool (such as a computer-based mapping program) to help with map creation.

In conclusion, a mental model is an appropriate tool for assessing systems thinking because it can assess how well a student understands concepts and solves problems in complex systems.

2.4.2.3. Systems thinking practices

Systems thinking is a key leadership skill that underlying root causes of the problem. Senge (1990: cited in Thornton et al., 2004) presents the allegories of systems thinking for a better understanding of it. It addresses the relationship within the systems such as:

"Today's problems come from yesterday's solutions."

"Dividing an elephant in half does not produce two small elephants."

"Small changes can produce big results."

To improve a student's systems thinking, they need to see the whole thing as a complex system in which everything is interconnected and understand the impact of each decision that one part of the system can affect other parts. Holistic thinking may be an essential concept in systems thinking, however, the complex characteristics of the systems might be a real challenge and make it not always sufficient (Forrester, 1971: cited in Atwater & Pittman, 2006). Some factors include that sometimes, the worse action in the short-term decision can lead to better long-term effects. At the same time, some problem resolutions that work well in the short term often cause long-term issues. These show the challenges of time and complex interactions. Atwater and Pittman (2006) suggest that the systems thinking descriptions are synthesized in three dimensions:

1) Synthetic Thinking is to study to understand the actions, roles, and purposes of a system and its parts.
2) Dynamic Thinking is to examine the actions of the system and its parts on how they behave over time.
3) Closed-Loop Thinking is to investigate the reactions and interactions of the parts of a system between each of them and with other external factors.

In business studies, teaching systems thinking is essential. Generally, the introduction to the business systems such as financial systems, accounting systems, and production systems makes the student see the interconnection of the functional areas well. However, the whole systems of the business still require many decision-making skills in the various process and the knowledge of the core skills is not enough. Systems thinking would enable students to learn those complex interactions (Atwater & Pittman, 2006).

Various tools are suggested to help to develop systems thinking. Generally, there are some tools in business studies that are used to manage the systems but to think in holistic images, a mental model is suggested (Senge, 1990: cited in Atwater & Pittman, 2006). This aligns with the use of the concept-mapping tool by Fraune (2013).

Atwater and Pittman (2006) suggest a "Causal Loop Diagram" (CLD). It is a type of mind mapping that consists of two types: reinforcing loops and balancing loops. The loops are made up of two or more variables and arrows that connect them in a closed-loop. The arrows are interpreted as cause and effect sequences in which the variable at the back of the arrow changes the behavior of the variable to which the arrow points. The arrows are shown with either a + or a – sign to indicate the type of change. The + sign denotes a change in both variables in the same direction. The – sign denotes that the two variables are changing in opposite directions.

To summarize, a teacher can use a mental diagram, such as a causal loop diagram, to map students' ideas of the overall system relationships and learn the complex interactions.

2.4.3. Critical thinking

Critical thinking skill is the ability to think logically and cognitively by acquiring adequate knowledge and evidence for evaluating and identifying assumptions (Moore & Parker, 2015; Watson & Glaser, 1964-2002). Taimur and Sattar (2019) argue that critical

thinking is one key competency in the cognitive domain to develop other competencies in ESD.

2.4.3.1. Critical thinking concepts

In McGraw-Hill's Critical Thinking book (Moore & Parker, 2015), there are lists of skills to be achieved as a critical thinker which are, for example;

1) Select the strongest ideas based on supporting data
2) Keeping in mind that there may be no obvious answer or single solution to an issue.
3) Consider other possibilities before making a judgment
4) Present the data analysis.
5) Attend to contradictory, inadequate, or ambiguous information
6) Recognize how evidence might be limited or compromised
7) Spot in the argument whether the claims are rational or emotional
8) Distinguish fact from opinion
9) Avoid drawing sweeping assumptions
10) Determine what information is pertinent or not.
11) Pointing out gaps in the evidence and offering further information to gather
12) Make linkages between distinct data and information sources.
13) Use evidence correctly and properly to support the case.
14) Present evidence in a way that helps to a convincing case.
15) Create compelling arguments based on evidence rather than opinion
16) Consider all suggestions from stakeholders or influenced participants before evaluation
17) Articulate the argument as well as its context
18) Spot deception and holes in the argument of others
19) Organize the argument logically and cohesively
20) Avoid using superfluous components in the construction of an argument

Taimur and Sattar (2019) argue that to apply critical thinking while solving a problem, an individual must have self-awareness and other skills that allow them to analyze and evaluate any judgments made. As a result, critical thinking dispositions should be fostered. The following are the seven dispositions.

1) Truth-seeking: to seek the best knowledge with the intellectual integrity to follow reasons in any situation
2) Open-mindedness: to accept and tolerance of different views, and be aware of any possible bias by self-monitoring
3) Analyticity: to recognize problematic situations and use logic and evidence to solve them.
4) Systematicity: to persist in approaching and solving problems of varying degrees of complexity.
5) Self-confidence: to believe in one's thinking and reasoning abilities.
6) Inquisitiveness: the desire to learn and acquire knowledge although its applications are not immediately obvious
7) Maturity of judgment: caution in forming, postponing, or modifying judgment: acknowledge that various answers may be appropriate; acknowledge the necessity to obtain closure although lack of comprehensive information

According to previous research, critical thinking in ESD is strongly linked to higher-order thinking in academic literacy (Bloom et al., 1956; Laoriendee, 2011; McKeown, 2002; Panich, 2012). It is also one of the essential skills for creating enduring understanding and sustainable development in learners (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; UNESCO, 2017). McKeown (2002) argues that critical thinking in ESD mainly focuses on critical thinking about value issues. UNESCO argues that critical thinking involves the ability to question, recognize, evaluate, and infer in conclusion. It claims to work along with problem-solving skills which could lead to

confidence in solving problems of sustainable development (UNESCO; 2005, 2012: cited in Juárez-Nájera, 2015). This links to critical thinking in the ESD concept by Raufflet et al. (2009), it involves learning to question and recognize assumptions to examine the major structures in sustainable development. The table below shows the concepts brought by the researchers which can be synthesized into the critical thinking concepts in ESD.

To summarize, critical thinking is the ability to think logically and cognitively by gathering sufficient knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. To meet the following criteria, critical thinking in ESD should address the value issues, dilemmas, and challenges of sustainable development to synthesize various concepts.

1) Question current norms, practices, opinions, and beliefs
2) Recognize the assumptions underlying our understanding, views, and opinions
3) Reflect on one's values, perceptions, and actions

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Table 14 The summary of critical thinking concepts in ESD

McKeown (2002)	*UNESCO; 2005, 2012: cited in Juárez-Nájera (2015)*	Raufflet et al. (2009)	UNESCO (2017)	Payutto (2018)
The capacity to consider value concerns critically.	**Critical thinking** and problem-solving are increasing courage in dealing with long-term development challenges and obstacles	**Critical thinking** is how a learner can question the present issues and recognize the assumptions underpinning society's views, attitudes, and understanding.	**Critical thinking competency** is the ability to challenge conventions, behaviors, and beliefs; to reflect on one's values, views, and behaviors; and participate in the sustainability discourse	**Wisdom development** is metacognition which is a solution to balancing behavior and mind. The wisdom will adjust and balance the quality of life to freedom and peace. A person should think critically and reasonably in both qualitative and quantitative approaches. The wisdom will lead a person to live smartly and be able to justify the true value of things.

2.4.3.2. Critical thinking assessment

Watson and Glaser (1964-2002) composed a set of tests for critical thinking skills to assess five different aspects of critical thinking which are:

1) Recognition of Assumptions is while there are several purposes, a critical thinker can identify the right assumption or presuppose that is taken for granted in the provided statement as “YES” or “NO” for each assumption.
2) Interpretation is to logically judge as “YES” or “NO” whether provided facts and data lead to what reasonable conclusion or not.
3) The inference is a claim that may be drawn from certain observable or assumed facts. An individual with critical thinking can recognize and distinguish between; “TRUE INFERENCE” which follows beyond a reasonable doubt from the provided facts and data; “PROBABLY TRUE” which has some clues that could be true data; “INSUFFICIENT DATA” if there is not enough information to tell if it is true or false facts; “PROBABLY FALSE” if there is closed to be more false data than true data and; “FALSE” if the information is seen to contradict to the facts or it is misinterpreted.
4) The deduction is a conclusion that follows beneath the provided data if it is “YES” for the true conclusion without exception” or “NO” for the unnecessary conclusion. The critical thinker should not prejudge or jump to a conclusion without adequate data.
5) Evaluation of Arguments is when a critical thinker decides on important questions. It is aimed that the critical thinker should distinguish between “STRONG” arguments and “WEAK” arguments, meanwhile, the question at issue is concerned.

This test is typically used for aptitude tests aimed at assessing the ability to think critically, understand the proper use of evidence to summarize data, apply logic to differentiate generalizations, inferences, and abstractions, and integrate all skills to

make an effective decision. Similar to Halpern (1989a: 5: cited in Węgrzecka-Kowalewski, 2018) who argues that it is "*the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions".*

Nachairit (2014: 58-65) has designed a learning model to enhance students' critical thinking skills and some other skills. He researched the concepts and progress of critical thinking from Dressel and Mayhew (1957); Watson and Glaser (1964); Kneedler (1985); Woolfolk (1987); Ennis (1985); and Decaroli (1973) and proposed that there are six skills that a critical thinker should have (Nachairit, 2014).

1) Deductive reasoning
2) Interpretation
3) Diagnose the validity of collective pieces of evidence
4) Inductive reasoning
5) Finalize results and choose wisely about the choices
6) Recognition of assumption

Węgrzecka-Kowalewski (2018) has researched assessment tools for critical thinking assessment to be used in intensive language instruction. Twenty-one instructors from six research universities who are sample studies in the research are shown to perform differently when they used the curriculum with or without combining critical thinking objectives. The group uses the re-designed curriculum in which the learning and instructional objectives combined critical thinking. In comparison to the group with standard structure-oriented language programs, they say that there was a high success rate in preparing overseas students for academic problems.

Table 15 A Synthesis matrix of critical thinking assessment criteria

Watson and Glaser (1964-2002)	Nachairit (2014)	Moore and Parker (2015)	Researcher's summary
Recognition of Assumptions	Recognition of assumption	Select the strongest ideas based on supporting data	Recognition of Assumptions
		Keeping in mind that there may be no obvious answer or single solution to an issue.	
		Consider other possibilities before making a judgment	
Interpretation	Interpretation	Present the data analysis.	Interpretation
Inference	Inductive reasoning	Attend to contradictory, inadequate, or ambiguous information	Induction and Deduction reasoning
		Recognize how evidence might be limited or compromised	
		Spot in the argument whether the claims are rational or emotional	
Deduction	Deductive reasoning	Distinguish fact from opinion	
		Aavoid drawing sweeping assumptions	
	Diagnose the validity of collective pieces of evidence	Determine what information is pertinent or not.	Diagnose the validity of collective pieces of evidence
		Pointing out gaps in the evidence and offering further information to gather	
		Make linkages between distinct data and information sources.	
Evaluation of Arguments	Finalize results and choose wisely about the choices	Use evidence correctly and properly to support the case.	
		Present evidence in a way that helps to a convincing case.	

Watson and Glaser (1964-2002)	Nachairit (2014)	Moore and Parker (2015)	Researcher's summary
Evaluation of Arguments (continue)	Finalize results and choose wisely about the choices (Continue)	Create compelling arguments based on evidence rather than opinion	Evaluation
		Consider all suggestions from stakeholders or influenced participants before eveluation	
		Articulate the argument as well as its context	
		Spot deception and holes in the argument of others	
		Organize the argument logically and cohesively	
		Avoid using superfluous components in the construction of an argument	

In conclusion, the critical skills for sustainable development can be assessed by measuring 5 abilities as follows.

1) Assumption Recognition

A critical thinker should be aware of the various sources of information but should be able to identify and select the correct assumption based on good decision-making.

2) Interpretation

A critical thinker can think logically to interpret ideas that go beyond references and facts and lead to appropriate consumption.

3) Induction and deductive reasoning

A critical thinker can draw conclusions based on facts or undeniable data based on experiences. Among contradictory, insufficient, or ambiguous information, he or she can recognize and identify rational claims that lead to reasonable conclusions.

4) Assess the credibility of collective pieces of evidence

A critical thinker can offer a variety of professional evidence-based sources. The evidence should be relevant, correct, and precise to support the conclusions of ideas.

5) Evaluation

A critical thinker can logically organize and construct the final evaluation based on the arguments and evidence.

2.4.3.3. Critical thinking practices

There are various ways to improve students' critical thinking skills. Nonis and Hudson (2019) investigated and discovered that problem-solving processes with creative assignments and timely experiential exercises to reinforce business studies

concepts can develop students' critical thinking abilities at both lower and higher levels, as well as encourage student interest. In a changing world, critical thinking can help with complex decision-making and dealing with large amounts of information (Critchley, 2011). It represents thinking skills in a more active, rather than the passive, manner, and can thus be promoted through learning and teaching practices. According to Critchley (2011), a metacognitive approach to teaching and learning is essential for developing critical thinkers. Sharing personal information and backgrounds in the classroom through various reflective thoughts on the diversity of values and cultures can improve critical thinking. It continues the thinking process as the students attempt to achieve the goal and make a decision. Students must develop their knowledge based on worldview thought and experiences. As a result, a teacher can use the constructivist approach to facilitate this learning and create an environment in the classroom that promotes effective thinking. Students should also learn how to apply their knowledge and skills in a practical setting (Gerald, 2013).

Gerald (2013) suggests the essential role in addressing the higher thinking skills in business education that the comprehensive view of effective thinking should be adopted in business studies. It includes 1) knowledge concepts, situations, principles, and errors) 2) skills (thinking tasks, methods, and heuristics), and 3) application (dispositions, and intellectual values). This would promote not only critical thinking but also analytical thinking, problem-solving, and decision-making.

Atkinson (2019) suggests the intervention to develop critical thinking skills in business studies which are adopted from the study from the based work of Belleara et al. (2016: cited in Atkinson, 2019)

1) Provide information ahead of time, as well as materials and guidance. It should employ higher-level questioning as well as tools and techniques to demonstrate the explicit form of critical thinking. This would also boost the student's

confidence and focus on the task at hand. The selection of resources should be based on familiarity at first to help students feel more confident in using strong academic language. The use of a basic framework with modified deeper thinking and higher-order questions was meant to eliminate the barrier to involvement that academic language sometimes generates.

2) Form small groups with mixed backgrounds. This would empower positive work habits.
3) Use Bloom's taxonomy to develop the stage of study to a higher level of thinking to ensure the learning outcomes meet both subject comprehension and critical thinking development.

To summarize, a teacher should facilitate students' work through well-designed instruction and a classroom environment to prepare students in advance to be confident in sharing their ideas with peers. Higher levels of thinking should be empowered in the instruction, progressing from basic concept understanding to application of knowledge in real-life problems.

2.4.4. Integrated problem-solving

As the world is confronted with various changes, such as technological disruptions and climate change, integrated problem-solving is a critical skill for achieving ESD's goal. It refers to a person's ability to use their knowledge and experiences to apply various methods to solve a problem (Aamodt, 1991; UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017).

2.4.4.1. Integrated problem-solving concepts

UNESCO (2017) defines Integrated problem-solving competency as one of the key competencies of ESD. It involves the use of knowledge to "apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive,

and equitable solution options that promote sustainable development, integrating the above-mentioned competencies". Aligning to Aamodt (1991), contradictions, which may occur during the knowledge integration process, can be divided into the one that can be solved by the system itself, while the other may need to be resolved by the person. This allows the person to collect valuable feedback to improve the cognitive domain that leads to a constructed knowledge model within the system. The integration should be the general approach to problem-solving, multi-paradigm reasoning, multi-paradigm learning, and integration aspects of combined reasoning and learning.

According to the previous research, it is the ability to use different methods by adapting various competencies to solve problems. It is applied from the concepts from UNESCO in the years 2005 and 2012 to focus the problem-solving skills as a way to address and solve the dilemmas and challenges of sustainable development. It mentioned the use of multi-methods in the learning process to solve problems that are both locally relevant and globally relevant. McKeown (2002) has argued that one key competency is to be able to integrate multi processes, for example, knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing to solve a problem. This follows Payutto's (2018) wisdom development concept which addresses the use of metacognition to solve a problem by using various methods (both qualitative and quantitative). The table below shows the concepts brought by the researchers which can be synthesized into the integrated problem-solving concepts in ESD.

Table 16 The summary of integrated problem-solving concepts in ESD

McKeown (2002)	*UNESCO, 2005, 2012: cited in Juárez-Nájera (2015)*	UNESCO (2017)	Payutto (2018)
The capacity to use multi methods to learn and solve issues	Critical thinking and **problem-solving** are increasing courage in dealing with long-term development challenges and obstacles	**Integrated problem-solving competency**: the ability to use various problem-solving frameworks to difficult sustainability challenges and produce equitable, inclusive, and viable solution alternatives that promote sustainable development, while combining the aforementioned abilities	**Wisdom development** is metacognition which is a solution to balancing behavior and mind. The wisdom will adjust and balance the quality of life to freedom and peace. A person should think critically and reasonably in both qualitative and quantitative approaches. The wisdom will lead a person to live smartly and be able to justify the true value of things.
	Multi methods are learning processes modeled by art, discussion, theatre, recreational experiences, various pedagogies, and so on		
	Locally relevant, effective, and contextual is using the languages that students are most acquainted with and emphasizing both local and global concerns	**Strategic competency** is the ability to create and implement new measures that promote sustainability at the local and global levels	

To summarize, integrated problem-solving is the ability to use knowledge and experiences to apply different methods to solve a problem. In ESD, integrated problem-solving addresses how a person can apply various skills and innovative solutions to model the learning process and solve the problems and challenges of sustainable development. It must meet the following requirements:

1) Apply different problem-solving frameworks to complex problems
2) Develop and implement innovative solution options
3) Use various processes in learning

2.4.4.2. Integrated problem-solving assessment

Eisenberg and Berkowitz (1987, 2018) introduce a rubric for an integrated problem-solving assessment that measures the student's progress in the 6 skill areas relevant to the problem-solving (called the Big6) by marking the level of achievement from 1=Awareness 2=Understanding 3=Demonstration and 4=Application. The Big6 problem skills are:

1) Task Definition
    a) Define the information problem
    b) Identify information needed
2) Information Seeking Strategies
    a) Determine all possible sources
    b) Select the best sources
3) Location and Access
    a) Locate sources (intellectually and physically)
    b) Find information within sources
4) Use of Information
    a) Engage (e.g., read, hear, view, touch)
    b) Extract relevant information

5) Synthesis
    a) Organize from multiple sources
    b) Present the information
6) Evaluation
    a) Judge the product (effectiveness)
    b) Judge the process (efficiency)

According to the Big6, the evaluation of integrated problem-solving should focus on how an individual can use diverse learning abilities to recognize challenges, know how to employ learning techniques, and access the necessary learning resources. Furthermore, the learner must synthesize and analyze the knowledge they have collected.

To summarize, a rubric assessment is an appropriate tool for assessing integrated problem-solving skills. It addresses the levels of achievement in each integration because the skill refers to the use of multiple methods and frameworks for problem-solving.

2.4.4.3. Integrated problem-solving practices

Incorporate integrated problem-solving into the classroom; it should address the application of abstract knowledge to real-world problems. The teacher should plan meaningful activities to promote students' cognitive-metacognitive development and affective competencies (Chong et al., 2019).

Chong et al. (2019) created the RECCE-MODEL framework (R: Realistic, E: Educational, C: Contextual, C: Cognitive, and E: Evaluation) to teach integrated problem-solving skills in mathematics. They observed that in their learning, high school students exhibited favorable attitudes and views about non-routine problem-solving. The model establishes a clear link between effective pedagogy and student learning, as well as between attitudes and cognitive abilities.

Realistic: The principle plays an imperative part in improving students' abilities of cognition and metacognition. Teachers must plan instructions centering on non-routine challenges which result in enhancing students' thinking skills and problem-solving skills. It also promotes the development of students' conceptual comprehension, application of abstract terminologies, and students' self-awareness, including self-regulation.

Educational: The principle is to design the curriculum to cover the Ministry of Education standards. Learning experiences must be designed to help students gain conceptual knowledge, ideas, and applications as part of an integrated learning process. The active class use tasks, activities, example works, and technology to assist learning and encourage the student to participate actively.

Contextual: The principle focuses on how students may integrate their information, ideas, and multidisciplinary experiences. This is to help students explain the goal of learning and engage with real-world situations by connecting ideas and controlling thinking rationally, clearly, and simply.

Cognitive: The idea is to increase students' thinking skills by investigating patterns, looking for answers, and creating hypotheses. To strengthen their communication abilities, the instructor encourages pupils to discuss and share their opinions and working techniques with others.

Evaluation: The principle is the teaching reflection by teachers. The teacher needs to evaluate the instruction to develop further learning and application skills of students.

In summary, to enhance integrated problem-solving skills, a teacher should focus on the transformation from conceptual understanding to real-life problem solving by designing effective instruction. The instruction follows the problem-solving model but the learning resources should encourage students to engage in problem-solving and think logically, precisely, and concisely.

2.4.5. Collaboration

Collaboration is the concept that aligns with the participatory skills which are also presented as a key skill in ESD as the collaboratively processes to solve a problem (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; Raufflet et al., 2009). It allows the collection of various perspectives for the co-creation of the effective solution in a more holistic view (Bell and Morse 2003; Jönsson 2004: cited in Zaffiro et al., 2020a)

2.4.5.1. Collaboration concepts

Collaboration is a necessary skill for achieving long-term development goals. It functions as a cross-sector collaboration that enables a group to generate shared values to cooperate with social responsibility. It can lead to novel working methods, the mobilization of difficult-to-access expertise, and the establishment of shared accountability in a more complex world (Albrectsen, 2017). It suggested that to effectively apply the collaboration concept in the classroom, it should be aware of inclusive language and relevant to the topics that students are interested in so that they will be motivated to share their ideas collaboratively (Reeves, 2019).

Collaboration is a key competency of ESD (UNESCO, 2017). It focuses on the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting (McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). It allows the individual to participate in making decisions about themselves while also empowering various people and groups (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; Raufflet et al., 2009). It is consistent with the ESD concepts in Buddhism that a person should behave well in his or her way of life and not encroach on the rights of others. The individual should be aware of his or her role in the community and be positive to others, not only to other people but also to nature (Payutto, 2018). The table below shows the concepts brought by the researchers which can be synthesized into the collaboration concepts in ESD.

Table 17 The summary of collaboration concepts in ESD

McKeown (2002)	*UNESCO, 2005, 2012: cited in Juárez-Nájera (2015)*	Raufflet et al. (2009)	UNESCO (2017)	Payutto (2018)
To work together with others To communicate effectively To produce an aesthetic response to one's surroundings.	**Participatory decision-making** Involves the learners' role in making decisions about their learning	**Participatory decision-making** is how a learner empowers various persons and groups. **Building partnerships** is how a learner promotes conversation and negotiation, as well as learning to collaborate	**Collaboration** is the ability to learn from others; to comprehend and value others' interests, viewpoints, and acts (compassion); to comprehend, respond to, and be empathetic to everybody else (empathic leadership); to cope with group problems, and to promote participatory and collaborative problem-solving.	**Behavior development** is when a person should behave well and not encroach on others. The behavior should be creative and positive to others including normal behavior or routine. A person must regularly behave nicely so it embeds in his/her way of living. It also encourages the behavior in working by being aware of the role of self in the community. The action would not encroach and disrupt others or nature.

To summarize, collaboration is the ability to work as a cross-sector partnership to generate shared values to cooperate with social responsibility. Collaboration in ESD refers to the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting. It denotes the ability to:

1) Participate in the group decisions
2) Learn from others
3) Communicate effectively to promote dialogue and negotiation to deal with conflicts

2.4.5.2. Collaboration assessment

Numerous researchers have studied the collaborative process and used a tool to assess and aid the process while students form groups. A self-evaluation tool is a type of assessment that assists users in understanding their challenges, strengths, and weaknesses as they strive to achieve their objectives. Furthermore, the outcomes will encourage group members to motivate themselves to work more effectively as a group (Borden & Perkins, 1999).

Borden and Perkins (1999) created a self-evaluation tool with 12 factors based on their research from various scholars. The tool is designed in the form of a checklist, allowing students to rate their collaboration on key factors ranging from "strongly agree" to "strongly disagree."

Each of the factors is as follows:

1) Communication - there is open and transparent communication throughout the partnership. There is a set procedure for communicating between meetings.

2) Sustainability - the partnership has an established strategy to keep members and supplies going. This includes participation standards for periods of duty and member replacement
3) Research and Evaluation - the partnership has completed a needs analysis or collected information to determine its objectives, and it is continuing to collect data to monitor goal success
4) Political Climate - there is a favorable history and climate around authority and decision-making. The political environment may exist inside the community overall, within community systems, or within community networks
5) Resources - the partnership has access to the resources it need. Resources are divided into four categories: environmental, in-kind, financial, and human capital
6) Catalysts - the partnership began since the existing problem(s) or reason(s) for collaboration demanded a complete strategy
7) Policies/Laws/Regulations - the partnership has altered policies, laws, and/or regulations that enable the collaboration to work efficiently
8) History - the society has a long history of working together to solve challenges.
9) Connectedness - this collaboration's participants are linked and have created informal and formal communication networks at all levels
10) Leadership - the leadership fosters and promotes team development while also capitalizing on diversity and individual, group, and organizational capabilities
11) Community Development - this community was organized to solve critical concerns. There is a communication network and centralized database pathways that allow for the study of issues, aims, and objectives
12) Understanding Community - the partnership comprehends the community, including its practices, beliefs, cultures, and people.

It is reasonable to assume that the checklist questions should take into account self-evaluation to be aware of each process of group work. It should demonstrate

collaboration in the setting of shared goals that meet the needs of the members, how each member works and communicates with a clear plan/guideline, and how the member's capacity is built. It is compatible with the Prevention Institute's Collaborative Effectiveness Assessment tool (PreventionInstitute, n.d.). The tool is also a self-evaluation checklist to evaluate the effectiveness of the collaborative group within four elements. The four elements include 1) Clarity of mission/Strength of vision 2) Communication/Link to others 3) The Collaborative Environment, and 4) Building Membership Capacity.

In summary, to assess collaboration, a self-evaluation tool is helpful as a student can check and evaluate his/her performance to be aware of personal goals, contributions, communication with others, and collaboration with peers.

2.4.5.3. Collaboration practices

Collaboration in the classroom is centered on shared knowledge between teachers and students. Teachers serve as "mediators" to assist students in learning, while students work together to implement assignments that require critical thinking skills. According to Tinzmann et al. (1990), a collaborative classroom can enable the students to communicate effectively while also influencing them to be successful learners. Collaborative learning, according to Tan, Gallo, Jacobs, and Lee (1999), can encourage students to develop cognitive students ' creativity and information technology. Students can interact with their peers while exchanging information by brainstorming, arguing, explaining, and persuading. Collaborative learning can help students improve their attainment, school engagement, inter-ethnic interconnection, self-esteem, satisfaction, and thinking skills (Cohen, 1994; D. W. Johnson & Johnson, 1989; Slavin, 1995).

According to Diane (1997: cited in Tinzmann et al., 1990), any size of collaboration is most effective when it takes advantage of the benefits of group contact. Both cooperative and collaborative learning emphasize group processing. Although

student-centered teaching focuses primarily on developing self-learning skills, working with others allows individuals to improve some skills together as well. Collaborative classrooms have four characteristics.

1) Shared knowledge among teachers and students

Traditionally, the teacher is viewed as a source of information. Rather than developing a student's independent learning skills, the teacher's role is to lead and teach the students to memorize. As a result, students have become more passive learners, emphasizing memorization while lacking creativity and critical thinking. Collaborative classrooms, on the other hand, place a premium on knowledge sharing. It not only allows the teacher to share knowledge with students but also provides them with important information. Collaborative instructions enable the teacher to value and build on students' knowledge, personal experiences, and strategies, including language, that they bring to the learning situation.

Students who have relevant experiences to the lesson content can enrich the entire class by sharing their experiences. In this way, students who share their knowledge will be able to fulfill their esteem from knowledge sharing. Peers would be motivated to learn more and pay more attention as well. As a result, significant connections are formed within classrooms as well as within the school environment. This is said to empower parents and community members to participate as well. Moreover, students can enhance their complex thinking towards difficult problems and challenges. While students exchange their information and experiences, they can explore more perspectives and solutions to the problems. Multiple ideas about the cause can be exchanged, including implications, and possible solutions.

2) Shared authority among teachers and students

In collaborative classrooms, teachers can share authority with students in a variety of ways. Traditionally, teachers' roles have been to establish a learning objective, design what students should learn, and devise methods for assessing learning. Collaborative teachers, on the other hand, can share procedures with students and include them in the instructional design process. Students can contribute to the framework of the learning goals, how the content should be taught, and learning strategy planning. Students can share their interests, which will encourage them to participate more actively in their learning. Teachers can create differentiated instruction to better meet the needs of each student. Teachers' roles in collaborative classrooms should empower students to understandably share and apply their knowledge and experiences. The teacher's strong support should improve critical thinking, creative thinking, and participation in open and meaningful dialogue.

Collaboration has two distinct advantages. For starters, students have more opportunities to ask and inquire about information relevant to their interests. Second, students have the opportunity to participate in decision-making. These are critical opportunities for self-regulated learning as well as motivation.

3) Teachers as mediators

As teachers in collaborative classrooms focus on sharing authority with students, the major role of the teachers should emphasize mediated learning. Effective mediation facilitates students to connect new information to their experiences. It prepares students to explore learning in other areas and learn how to learn. Being a mediator means the teacher has to be very supportive.

4) Heterogeneous groupings of students

The backgrounds, experiences, and attitudes of all students value learning in the classroom. The ideas of sharing authority enlarge diverse perspectives to be exchanged

within classrooms. Students would have more opportunities to learn about multiple contexts in schools. Students learn from each other and can contribute their thoughts. Segregation in traditional classrooms weakens collaboration and impoverishes learning in classrooms. Brighter and smarter students may block other weaker students learning.

As a result, by sharing information and authority, teachers and students can transform their relationships. Teachers' new instructional methods are distinguished by the teacher's role as a learning mediator. The composition of collaborative classrooms is addressed by emphasizing different student groupings. All of these aspects of collaborative classrooms contribute to meaningful classroom learning. Following Brody and Davidson (1998), collaboration in classrooms focuses on teachers and students sharing common goals. They may have a similar problem or task. Each student accepts accountability or self-responsibility while cooperating with others to help the entire group achieve the goal. Teachers serve as mediators.

Collaborative learning in English language classrooms is suggested to 10 elements (Ibrahim et al., 2015).

1) The teacher facilitates students as a guide or moderator. The teacher focuses on giving useful feedback to support students to learn. Students should be encouraged to freely work and solve problems based on the teacher's recommendations.
2) Verbal assessment or written assessment should be used to document each group work process. This should keep both teacher and students productively engaged and discussed in the classroom. Students can also use the results to reflect on themselves.
3) The teacher should define clear objectives of a particular activity. As the collaborative classrooms focus on sharing work and common goals, students can aware of that and help each other to achieve the goals together.

4) The students should have the opportunity to contribute ideas. This allows students to exchange their opinion to make a decision together more effectively.
5) A group member should give positive feedback to another member's idea. Giving positive feedback can facilitate collaboration among group members.
6) Interaction is the key. While students have real-time interaction, they tend to feel less isolated and participate more. This also boosts their confidence and motivation to learn.
7) Effective communications can promote a friendly environment in classrooms. While students see other students working busily, they can be motivated easily.
8) Each student holds accountable for their responsibility. Collaboration is when each person works on their task but also supports others at the same time.
9) The group's success is based on the strengths of each student. Students will feel happy and satisfied with themselves once they have worked together to generate positive results.
10) Students should analyze the strengths and weaknesses of the completed work. This allows them to improve their work in the future.

These elements mostly focus on teacher facilitation, use of group processing, interpersonal skills among and within groups, and real-time interaction or effective communication, as well as proper material usage, positive independence, and individual accountability. They link with the collaborative learning concepts of R. T. Johnson and Johnson (1994) which have 5 key elements which are: 1) positive independence 2) Individual accountability/ Personal responsibility 3) face-to-face promotive interaction 4) interpersonal and small group skills, and 5) group processing.

According to Shafie, Maesin, Osman, Nayan, and Mansor (2010), well-organized collaborative projects will encourage students to work well with others, increasing creativity and, as a result, production. Sharan (2015) further said that interactions between students and teachers, as well as among students, can foster a collaborative

classroom in which students gather information, share ideas and insights, and build valuable information.

In conclusion, allowing for shifting relationships between teachers and students can improve classroom collaboration. A teacher's main focus should be on sharing knowledge and power. Teachers' new instructional methods are distinguished by the teacher's role as a learning mediator. The composition of collaborative classrooms is addressed by emphasizing different student groupings.

In conclusion, to meet the ESD goal, a student should possess the 5 skills which are as follows.

1. Self-awareness refers to the ability to reflect perceived experiences within a multidimensional phenomenon while also being aware of personality traits, goals, emotions, attitudes, preferences, intentions, and so on to move to action in the future. The self-awareness in ESD addresses reflecting on one's role in a community that shares the values and principles that underpin sustainable development and society to set visions and plans for the future. It must meet the following requirements.
    a. The ability to be aware of one’s need by reflecting on his/her role in society
    b. The ability to create a clear and valuable vision, and plan for the future
    c. The ability to move from awareness to knowledge to action.
    d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
2. Systems thinking refers to the ability to see the big picture of a whole system in complex relationships and comprehend its dynamic interactions and feedback loops, which are characteristics of complex adaptive systems. Systems thinking in ESD addresses how a person recognizes, links, and synergizes embedded

relationships while solving problems to synthesize various concepts. It must meet the following requirements.

a. The ability to recognize and understand relationships in a whole picture

b. The ability to analyze and synthesize embedded relationships among them

3. Critical Thinking refers to the ability to think logically and cognitively by gathering sufficient knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. To meet the following criteria, critical thinking in ESD should address the value issues, dilemmas, and challenges of sustainable development.

    a. The ability to question current norms, practices, opinions, and beliefs

    b. The ability to recognize the assumptions underlying our understanding, views, and opinions

    c. The ability to reflect on one's values, perceptions, and actions

4. Integrated problem-solving refers to the ability to use one's knowledge and experiences to solve a problem using a variety of methods. Integrated problem-solving in ESD addresses how a person can apply various skills and innovative solutions to model the learning process and solve the problems and challenges of sustainable development. It must meet the following requirements.

    a. The ability to apply different problem-solving frameworks to complex problems

    b. The ability to develop and implement innovative solution options

    c. The ability to use various processes in learning

5. Collaboration refers to the ability to collaborate as a cross-sector partnership to generate shared values to cooperate with social responsibility. Collaboration in ESD refers to the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to

effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting. It must meet the following requirements.

a. The ability to participate in the group decisions
b. The ability to learn from others
c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts

These five skills imply that students should be aware of themselves and what is important to them and their society. They must also improve their thinking skills, which are more concerned with "learning how" than "learning what," or what we call "learning how to learn." It is the foundation for learners' long-term understanding. Finally, learners could benefit not only from self-directed learning but also from collaborating and participating with others. Since goal-setting, practitioners suggest that learners be reminded that they are members of the community. When learners think or act, they should be aware of their society's cultural dimensions and diversity; this leads to effective systems thinking and critical thinking skills. The mixed methods should be integrated to respond to the complexity. It values sustainable development in learners as being a good asset in society along with developing self-consciousness.

As one of the research objectives is to study the effectiveness of the constructivist instructional model to empower the 5 ESD skills, the tool to be used must allow the researcher to obtain data about the students' performances and achievements as well as to be able to measure the levels of increasing complexity in students' skills development. Thus, the researcher designs the skills for ESD evaluation form containing two types of data collection which are 1) rating scales used with rubrics for assessing different criteria of each skill that are presented in the synthesis of each skill's concepts, and 2) evidence presentation that allows the researcher to collect different data from

various tools at different times as it can be seen from the previous researches that each skill requires different tools and practices during learning.

The rubrics are designed by the SOLO (Structure of Observed Learning Outcomes) taxonomy concept that was proposed by John B. Biggs and Kevin F. Collis to represent the growing complexity of one's topic comprehension. The researcher chose the SOLO taxonomy as it is explicitly useful for judging the outcomes of the activity than other taxonomies. Moreover, it allows the both students and teacher to use progressively to evaluate complex cognitive process of students' learning, and how teacher contrives instructions, not only item construction and scoring (Ennis, 1985: cited in Hook, 2013).

The 5 levels rubrics align with SOLO's five levels of understanding which are:

1. Pre-structural – This level indicates that the work is not approached effectively; the learner has not fully grasped the concept and employs an overly simplistic approach. Students may generally react to queries with irrelevant comments.
2. Uni-structural – This level indicates that a student's response is limited to a single relevant aspect. Students typically provide marginally relevant but ambiguous answers that are lacking in depth.
3. Multi-structural — This level indicates that the student's response focuses on numerous significant issues, yet they are addressed separately and additively. Students may know the notion in bits and pieces but cannot express or explain it.
4. Relational – This level indicates that many parts have been combined into a cohesive whole. This is what most people mean when they say they have a good comprehension of something. Students may recognize multiple patterns and examine a topic from various viewpoints at the relational level.

5. Extended abstract – This level indicates that a prior integrated whole can be conceptualized at a higher degree of abstraction and applied to a new topic or area. At this point, students may apply classroom principles in real-world situations.

Chapter 3

Research Methodology

Research Design

The researcher uses the research and development methodology as the focus of this study is to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.

Research (R1): During this phase of research, the researcher studied business studies standards and student backgrounds as well as relevant theories and concepts including instructional model, constructivist concept, self-directed learning approach, issue-based learning approach, and five skills for ESD which are self-awareness, systems thinking, critical thing, integrated problem-solving, and collaboration. The research also surveyed and interviewed stakeholders to understand the current situation, needs, expectations, and some guidelines to assist the researcher to develop an effective instructional model to meet their preferences. The human resources consisted of 113 students in Business studies electives in the school year of 2020 at the Mahidol University International Demonstration School, two business studies teachers from the same school, and three experts in relevant fields. The students were studied to understand the self-directed readiness and barriers to developing skills for ESD using two questionnaires. Secondly, the two teachers were interviewed using semi-structured interview questions to understand the current situation and expectations to develop and implement effective instruction to empower skills for ESD in the classroom. Lastly, the three experts were interviewed using semi-structured interview questions to explore guidelines for developing the model.

Development (D1): The second phase of the study is to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand. The researcher designed the model and tools to be used with the model which consists of the model, model manual, unit plan, and the Skills for ESD evaluation form as the tool to evaluate the effectiveness of the model. Then, the researcher evaluated the quality of the tools using the content validation form using the Likert Five Rating Scales to find a mean ($\bar{x}$) and standard deviation (S.D.) for interval data with seven professionals. Then, reassess and modify the model and the tools to be used with the model from the experts' recommendations.

Research (R2): At this stage, the developed model was tested on the study's sample of 24 students from the Skills for Leadership and Management class. As the teacher, the researcher went over the content and objectives of UNIT 4 M-Business. The objectives of using the constructivist instructional model with self-directed and issue-based learning were then reviewed. The teacher explained the teacher's and students' roles in the self-directed learning project. The teacher advised students on how to use their peers and teachers as resources, motivated them, and guided them through the project. The rubrics and assessment tools were also provided and clearly explained. The students applied to work in five departments (Production, Public relations, Human resources, Finance, and Marketing) and a presidential role to create and run a business. It took 10 weeks to complete the implementation.

Development (D2): In this final stage, the effectiveness of the model was investigated to determine the results for empowering ESD skills after using the model. The skills for ESD evaluation form was used by students to evaluate their outcomes to meet the goals for skills for ESD development at the final stage of the project. They must provide pieces of evidence to reflect how they achieve their goals to develop certain

skills. The teacher also observed and evaluated the students' performance throughout the learning process to be used for finding discussions.

The research methodology of this study is shown in *Figure 10*.

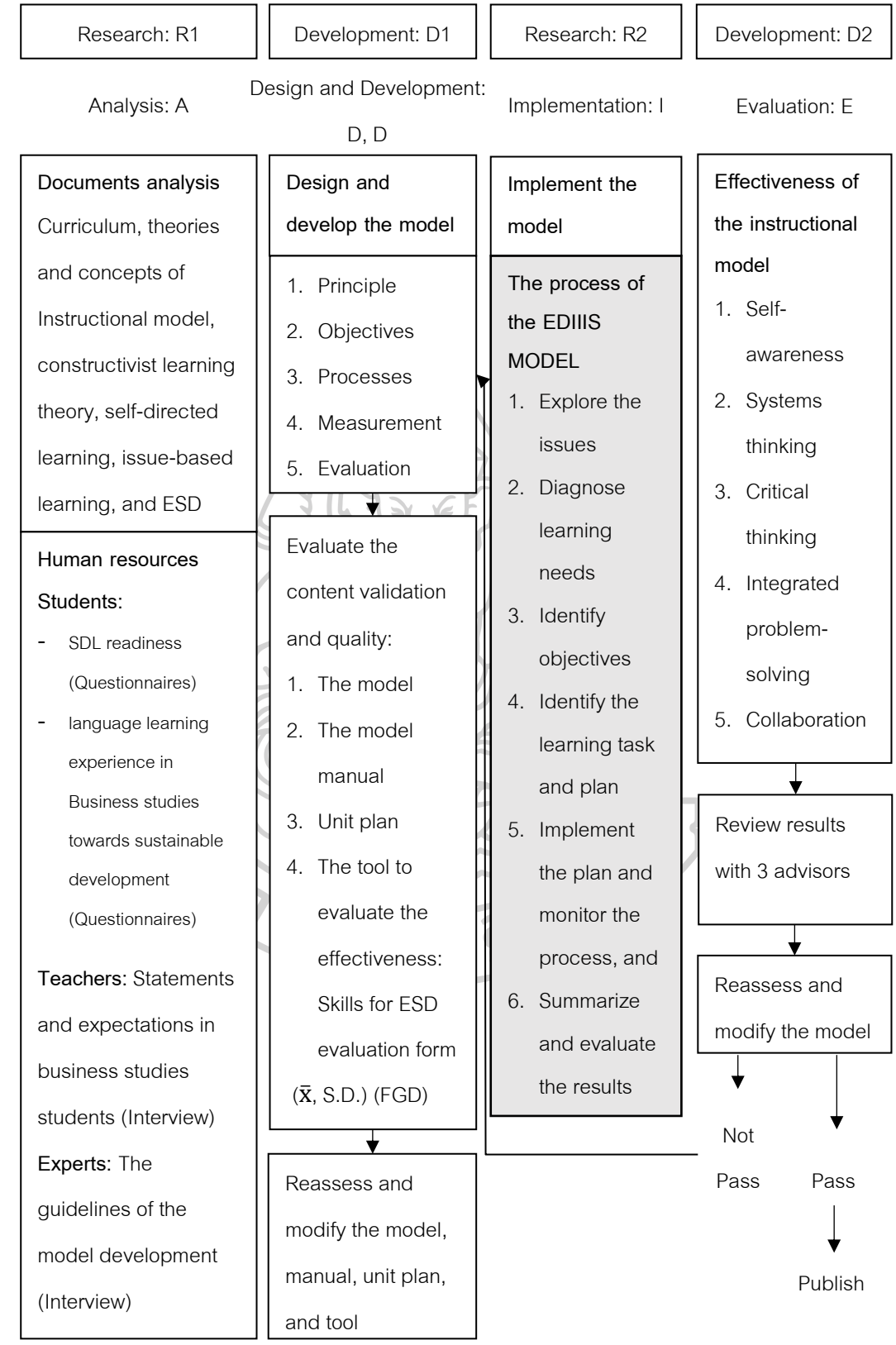


Figure 10 Research Methodology Framework

STEP 1 Research (R1)

This research firstly points to the experiences of the students' perceptions toward their learning to understand the obstacles which hinder them from empowering skills for ESD. Accordingly, the mixed method is applied in exploratory design to study how the constructivist instructional model should be designed to meet the need of the students.

Objectives

To study basic information to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand

1) To study backgrounds, relevant theories, studies, and research to the model development
2) To study student's self-directed learning readiness
3) To study student's language learning experience in Business studies toward sustainable development
4) To study statements and expectations in business studies students.
5) To study the guideline for developing a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand

Resources

Documents

The relevant documents and research about the American States common core standards, and the school ESLO. The theory concepts of the Instructional model, self-directed learning theory, sustainable development principles, schemes and skills, and critical thinking skills.

Human resources

1) 113 students who study Business Electives in MUIDS in the school year of 2020. The sample is selected using volunteering selective from overall 160 students. The sample size is calculated from Krejcie and Morgan's sample size table (1970: 608, as cited in Nillapun, 2015).
2) Two Business Studies teachers who teach Business Electives in MUIDS in the school year of 2020. They are purposively selected.
3) Three experts from the relevant fields to the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.

Variables

1) The experiences and statements of problems of the current Instruction towards students' skills for sustainable development
2) The problem of the Business Studies students' skills for sustainable development and expectations
3) The guideline of the effective self-directed approach to empower students' skills for sustainable development.

Methodology

1. Study the relevant documents and research

The researcher investigates the structure of the social studies curriculum as well as the Skills for Leadership and Management curriculum standard. The researcher also investigates school visions and ESLOs, which demonstrate interdisciplinary skills for sustainable development and are curriculum and instruction development principles. Furthermore, the students' backgrounds are studied to understand the various needs and gaps of students to consider any concerns to the development of the instructional model. Survey data from school surveys and professional development workshops are documented to understand student skill statements and language barriers.

1.1. UNESCO has declared that the Education for Sustainable Development issue is the education goal for this era. The main idea is to have students develop both in-person as individuals and in interrelation with others as global citizens. In Thailand, the Ministry of Education has also addressed the importance of ESD focusing on Professional and Learning Development for ESD, especially to empower Thai teachers and learners to meet the global expectations.

1.2. The Mahidol University International Demonstration School's expected school-wide learner outcomes (ESLOs) are linked to the ESD goals in the 21st century. They focus on six key skills which are 1.) Strategic learners 2.) Innovative thinking 3.) Articulate speaking 4.) Morally intelligent 5.) Global citizens 6.) Future leadership.

1.3. Social Studies Curriculum of the Skills for Leadership and Management subject shows the interdisciplinary towards skills for sustainable development. The course focuses on building students' knowledge, skills, and attitude that are the foundation and essential to prepare the students to compete in a global, information-based economy. These meet the Leadership course standards and school ESLOs of MUIDS to demonstrate real-life learning as pathways for students' future as lifelong learners.

1.4. The background of learners in MUIDS data analysis reveals that many students struggle with self-direction as a result of their previous school background. Significant intercultural and communication issues are also caused by family background and demographics. Some students may have a language barrier that prevents them from understanding the lesson explicitly in the classroom, preventing them from acquiring knowledge and meeting learning outcomes.

2. Review the literature about the instructional design concept, constructivist learning theory, self-directed learning, issue-based learning, and education for sustainable development from secondary research data.

2.1. The instructional model refers to the systematic nature of teaching and learning to achieve a specific purpose of a pattern. The instructional design aligns with the ADDIE model. It is an instructional system design model that aims to serve the target needs. A model is an interactive approach that five phases which are 1) Analysis: The researcher studies and collects data including needs, gaps, and importance to use as a framework to develop a model 2) Design: The model and tools to be used with the model including manual, tools, or other documents are designed 3) Development: The model and all materials are created 4) Implementation: The materials are implanted in a sample group or target to meet the output. 5) Evaluation: The effectiveness of the model and materials are evaluated after the complete implementation. The model consists of 1) principle 2) objectives 3) processes 4) measurement and evaluation, and 5) conditions.

2.2. Constructivist learning theory is used in instructional design to meet education for sustainable development goals by focusing on teacher and students' roles. The teacher should prepare an effective plan, guidance, and support materials to empower students' skills. The teacher is a role model who plays an important role to facilitate and encourage students to empower ESD skills. The students should actively engage, be motivated to discuss, and exchange various ideas from different viewpoints to effectively construct knowledge.

2.3. Self-directed learning focuses on driving a student's motivation in learning. The learner learns what is important to know and is an achievable goal in the current situation and can be useful in their future while using teachers and peers as supportive resources. Self-directed learning aims to develop learners' metacognitive processes and allow the learner to plan and monitor their learning based on individual needs. The processes of self-directed learning are 1) Diagnose learning needs 2) Identify objectives 3) Plan learning activities 4) Implement and monitor process 5) Evaluate and reflect on learning.

2.4. Issue-based learning is another ESD pedagogies that shows the steps of using problems or issues relevant to students to motivate them in learning and finding solutions. It suggests students explore real-life issues of concern to themselves. This encourages students to use higher-order thinking including reflective thinking through an active and participatory approach in which students can share their perspectives along with listening to others. There are 6 steps of issue-based learning which are 1) Explore and prioritize the issues 2) Understand the problem 3) Identify the learning tasks and plans 4) Implement the plan and learn 5) Summarize and present the solution, and 6) Evaluate results.

2.5. Education for Sustainable Development refers to the lifelong learning of learners to meet the global evolution challenges in three major areas which are social, economic, and environmental issues. The principles of ESD aim to develop a person both intrinsically and extrinsically. The learners are believed to develop individual mindset, wisdom, and behavior to respond to the needs of global sustainability. The researcher synthesized skills for ESD into 5 skills which are 1. Self-awareness 2. Systems thinking 3. Critical thinking 4. Integrated problem-solving, and 5. Collaboration.

2.6. Self-awareness is the ability to be aware of personal abilities, strengths, weaknesses, and limitations, to set goals, and plans, and achieve them. It also encourages a person to think about the presence of self and the role of self in the community, and global. This would help the person to drive the values himself/ herself to develop in sustainable manners. Self-awareness in ESD refers to the ability to 1) Be aware of one's need by reflecting on his/her role in society 2) Create a clear and valuable vision, and plan for the future 3) Move from awareness to knowledge to action, and 4) Evaluate and assess the consequences of actions to deal with conflicts and changes. To assess self-awareness, the tool should focus on helping an individual aware of their

statements, reflective thoughts towards self-relevant to sustainable goals, and evaluate self to be able to set goal process so they can fully commit to their goal with motivation. It can be enhanced by practicing their mind, body, and mind and body together. He or she can focus on valuable reflection on self by self-reflection or from other people's reflections. The mind should focus on the present state to set goals that important to self and others. At the same time, to achieve the goals, he or she should also understand strengths, weaknesses, and limitations so, one can set action plans and know to seek help when in need.

2.7. Systems thinking is the thinking process of how a person can see the relationship of the whole complex system. It is the ability to recognize and understand relationships; analyze complex systems; think of how systems are embedded within different domains and different scales, and deal with uncertainty. It shows that a person should be able to see the big picture as a whole whereas it might be complex. However, the person needs to understand this complexity and be able to deal with them. It helps the person to understand the complex relationship in systems that are embedded as wholes and be able to deal with uncertainty. The concepts can be linked to wisdom development that is focusing on acknowledging and balancing behavior and mind. It suggests the person adjust and balance thinking and action to deal with uncertainty. Systems thinking in ESD refers to the ability to 1) Recognize and understand relationships in a whole picture, and 2) Analyze and synthesize embedded relationships among them. To assess systems thinking, a mental model is a proper tool as it can assess how a student understands the concepts and solves a problem in complex systems. To enhance systems thinking, a teacher can use a mental diagram such as a causal loop diagram to map students' ideas of the whole system relationships and learn the complex interactions.

2.8. Critical thinking skills are defined as the higher-order thinking skills that are the ability to think logically and cognitively. It strongly links to the higher-order thinking in academic literacy and is also one of the essential skills for creating enduring understanding and sustainable development in learners. Critical thinking in ESD mainly focuses on thinking about value issues. UNESCO argues that critical thinking involves the ability to question, recognize, evaluate, and infer in conclusion. It claims to work along with problem-solving skills which could lead to confidence in solving problems of sustainable development. It involves learning to question and recognize assumptions to examine the major structures in sustainable development. Critical thinking in ESD refers to the ability to 1) Question current norms, practices, opinions, and beliefs 2) Recognize the assumptions underlying our understanding, views, and opinions, and 3) Reflect on one's values, perceptions, and actions. The critical skills for sustainable development can be assessed by measuring 5 abilities which are recognition of assumptions, interpretation, induction and deduction reasoning, diagnosis the validity of collective pieces of evidence, and evaluation. To improve students' critical thinking, a teacher should facilitate students to work through a well-designed instruction and classroom environment to prepare students in advance to be confident to share their ideas with peers.

2.9. Integrated problem-solving is the ability to use different methods by adapting various competencies to solve problems. It is applied from the concepts from UNESCO in the year 2005 and 2012 to focus the problem-solving skills as a way to address and solve the dilemmas and challenges of sustainable development. It mentioned the use of multi-methods in the learning process to solve problems that are both locally relevant and globally relevant. The key competency is to be able to integrate multi processes which are knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing to solve a problem. It also addresses the use of metacognition to solve a problem by using various

methods (both qualitative and quantitative). It is the ability to 1) Apply different problem-solving frameworks to complex problems 2) Develop and implement innovative solution options, and 3) Use various processes in learning. To assess integrated problem-solving skills, a rubric assessment is a proper tool. It covers the levels of achievement in each integration as the skill refers to the use of muti-methods and different frameworks for problem resolutions. To enhance integrated problem-solving skills, a teacher should focus on the transformation from conceptual understanding to real-life problem solving by designing effective instruction. The instruction follows the problem-solving model but the learning resources should encourage students to engage in problem-solving and think logically, precisely, and concisely.

2.10. Collaboration motivates a group to generate shared values to cooperate with social responsibility. It can lead to innovative methods of working, mobilizing expertise, and resources that are hard to reach, including creating shared accountability in a more complex world. It addresses the ability to collaboratively work with others by understanding and respecting others regarding different needs, perspectives, and actions. It allows a person to effectively communicate and use interpersonal skills with others, and also deal with conflict in a group smoothly. It helps the person participate in decisions about themselves while empowering different people and different groups. It aligns with the ESD concepts in Buddhism that a person should behave well in his/ her way of living and not encroach on others. The person should aware of his/her role in a community and be positive to others, not just with other people, but also with nature. The researchers synthesized collaboration concepts in ESD to the ability to 1) Participate in the group decisions 2) Learn from others, and 3) Communicate effectively to promote dialogue and negotiation to deal with conflicts. To assess collaboration, a self-evaluation tool is helpful as a student can check and evaluate his/her performance to be aware of personal

goals, contributions, communication with others, and collaboration with peers. To enhance collaboration in classrooms, and to allow for interrelations between students and teachers, education is focused on sharing knowledge and authority. Teachers' new approaches to instruction are defined by the teacher's role as a facilitator of learning. The collaboration in the classroom is addressed by highlighting heterogeneous groups of students. Individual accountability, positive independence, effective communication and leadership among and within groups, real-time interaction, and group processing should all be used by the teacher.

3. Primary data research from learners, teachers, and stakeholders
   3.1. The questionnaires are distributed to 113 Business Studies students to collect data on the basic skills in self-directed learning, the language learning experience in the business studies, and the effect on developing ESD skills.
   3.2. The interview is conducted for 2 teachers in Business Studies subjects to understand the problem of the Business Studies students' skills for sustainable development and the guideline of the effective self-directed approach design to empower students' skills for sustainable development.
   3.3. The expert interview is conducted for 3 professionals in Instructional model design to empower students' skills for sustainable development.
4. The researcher analyzes the basic information and reviews the qualitative data with 3 advisors.

Tools

Regardless of secondary data research from relevant documents and involved theories, primary data research is conducted to understand the current context of the students, expectations, and opinions on the instruction to improve ESD by teachers, and significant inputs from experts to be integrated into the model's development and implementation by using:

1. Questionnaires for student's self-directed learning readiness
2. Questionnaires for student's language learning experience in Business studies toward sustainable development
3. Semi-structured interview questions about the Self-directed learning readiness of Business Studies students and the expectations of Business Studies students' skills
4. Semi-structured interview questions about a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand

The students' Questionnaires

The questionnaires are used to assess readiness for self-directed learning. The study polled 113 students enrolled in Business Studies classes for the 2020 school year.

1. Questionnaires for student's self-directed learning readiness

The process of designing the self-directed learning readiness questionnaire are;

1.1. Determine the objective of the questionnaires: The self-directed readiness questions are designed based on the five major processes in self-directed learning; 1. Viewing peers as resources 2. Being able to give and receive help 3. Developing good social skills 4. Being motivated to learn and 5. Taking initiative and responsibility for learning. The questions to study the learning experiences in Business Studies affect critical thinking focus on the Business Studies Students' learning gap in empowering their critical thinking or higher-order thinking in classrooms.

1.2. Draft the 3 sections of the questionnaire which start with; 1) Demographic data of the participants which are gender, grade level, current business studies subject, other electives, and experience level in learning business 2) The rating-

scale questions about the student's learning preferences and attitudes towards self-directed learning consist of 17 questions adapted from the five learners' capacities of self-directed readiness (Lubbe, 2015b) 3) The final section where the student can provide additional information and opinions to the questionnaire.

1.3. Evaluate the content validity of the questionnaire based on the five learners' capacities of self-directed readiness (Lubbe, 2015b) by 5 experts. The experts are 2 academic experts, 1 student learning support expert, and 2 professionals in ESL learners' pedagogies. The validity assessment is designed by the concept of the Likert Five Rating Scales to find a mean ($\bar{x}$) and standard deviation (S.D.) for interval data.

Firstly, the experts are given scores from 5 to 1 scales which means:

5 = The question item is extremely congruent with the objectives

4 = The question item is very congruent with the objectives

3 = The question item is somewhat congruent with the objectives

2 = The question item is not so congruent with the objectives

1 = The question item is not congruent with the objectives

The scales collected from the experts later are calculated to find the mean ($\bar{x}$) to identify the validity using the below function;

$$\bar{x} = \frac{\sum x}{n}$$

$\bar{X}$= mean of total scores

$\sum x$ = total scores

n = number of experts

The numbers can be interpreted as follow.

Scale Score	Meaning
4.50 - 5.00	Very High
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
1.00 – 1.49	Very Low

The result shows that $\bar{x}$ varies from 4.00 – 5.00 and S.D. varies from 0.45 – 1.00 which means that the questionnaire has high-quality validity and can use to collect data.

1.4. Modify the questionnaire from the suggestions of the experts. The experts' recommendations are shown in table 18.

Table 18 Recommendations on the self-directed learning readiness questionnaires

No.	Recommendations	Modifications
3.	“Free-choose” to “Free choice”	3. Free-choice topic for assignments motivates me to learn.
7.	“can I” change to “I can”	7. I know where I can find out what I need to know.
8.	“can I” change to “I can”	8. I know who I can ask for help.
9.	Too complicated for the students to understand	9. The primary reason I work is just to get the expected grade.
12.	Make sense of things = explain things	12. I always depend on the instructor to explain things I don't understand.
14.	Clarify “pieces of evidence	14. The researched data I found on my own usually help me to complete my work with great results.
15.	Clarify “pieces of evidence	15. Teachers or peers sometimes suggest useful information/ data which I can't find on my own.

1. Questionnaires for student's language learning experience in Business studies toward sustainable development

The process of designing the Language Learning in Business Studies questionnaire is:

1.1. Determine the objective of the questionnaires: The questions are designed to study how students struggle in their classes due to language barriers.

1.2. Draft the 3 sections of the questionnaire which start with 1) Demographic data of the participants which are gender, grade level, current business studies subject, other electives, and experience level in learning business 2) The rating-scale questions about the student's learning preferences and attitudes towards self-directed learning consist of 12 questions based on the language goals and 3) The final section where the student can provide additional information and opinions to the questionnaire.

1.3. Evaluate the content validity of the questionnaire about language learning in Business Studies by the 5 experts same as previous tools. The validity assessment is designed by the concept of the Likert Five Rating Scales to find a mean ($\bar{x}$) and standard deviation (S.D.) for interval data.

Firstly, the experts are given scores from 5 to 1 scales which means

5 = The question item is extremely congruent with the objectives

4 = The question item is very congruent with the objectives

3 = The question item is somewhat congruent with the objectives

2 = The question item is not so congruent with the objectives

1 = The question item is not congruent with the objectives

The scales collected from the experts later are calculated to find the mean ($\bar{x}$) to identify the validity using the below function.

$$\bar{x} = \frac{\sum x}{n}$$

$\bar{X}$= mean of total scores

$\sum$x = total scores

n = number of experts

The numbers can be interpreted that:

Scale Score	Meaning
4.50 - 5.00	Very High
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
1.00 – 1.49	Very Low

The result shows that the $\bar{x}$ varies from 3.80 – 4.80 and S.D. varies from 0.45 – 1.00 which means that the questionnaire has high-quality validity and can use to collect the data.

1.4. Modify the questionnaire from the suggestions of the experts. The recommendations are shown in Table 19.

Table 19 Recommendations on Languages Learning in Business Studies

No.	Recommendations	Modifications
2.	Unclear/ Repetitive words	2. I can express my thoughts or feelings in English very well
3.	Terminologies Thai to English	3. I always ask my friends when I don't understand some words or terminologies in English.
8.	Add the opposite question of writing/ speaking	Add 9. I think writing helps me to express more ideas than speaking.

No.	Recommendations	Modifications
10.	Too complicated for students to understand “interpret” and “secondary data”	11. It is easy to rewrite the researched data in my language.
12.	Too obvious about the translation tool.	12. When I encounter new terminology, I usually translate it into my native language to understand the meaning.

The teachers’ interview

The semi-structured interview questions are designed to evaluate the students’ self-directed learning readiness from the Business Studies teachers’ point of view. The data is aimed to address the role of the teachers as resources to assist students in learning.

The teachers are expected to understand the basic information of the students in their classes to design an effective instructional model in self-directed learning pedagogy. The interview is done face-to-face with a one-to-one interview with the researcher. It aims to get opinions and ideas from each teacher without privacy disruption.

The process of designing the semi-structured interview guidelines is as follows.

1.1. Determine the objective of the questions: The questions are designed to study teachers’ opinions towards the Self-directed learning readiness of Business Studies students and the expectations of students’ ESD skills.

1.2. Draft the interview guidelines consisting of 8 questions.

1.3. Evaluate the content validity of the questions about language learning in Business Studies by 5 experts. The validity assessment is designed by the

concept of the Likert Five Rating Scales to find a mean ($\bar{x}$) and standard deviation (S.D.) for interval data.

Firstly, the experts are given scores from 5 to 1 scales which means

5 = The question item is extremely congruent with the objectives

4 = The question item is very congruent with the objectives

3 = The question item is somewhat congruent with the objectives

2 = The question item is not so congruent with the objectives

1 = The question item is not congruent with the objectives

The scales collected from the experts later are calculated to find the mean ($\bar{x}$) to identify the validity using the below function:

$$\bar{x} = \frac{\sum x}{n}$$

$\bar{x}$= mean of total scores

$\sum x$ = total scores

n = number of experts

The numbers can be interpreted as;

Scale Score	Meaning
4.50 - 5.00	Very High
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
1.00 – 1.49	Very Low

The result shows that $\bar{x}$ varies from 4.00 – 5.00 and S.D. varies from 0.00 – 0.89 which means that the questionnaire has high-quality validity and can use to collect the data.

1.4. Modify the questions from the suggestions of the experts. From the evaluation of the content validity, the experts recommended the researcher to modify some points in the questionnaire as shown in *Table 20.*

Table 20 Recommendations on teachers' interview questions

No.	Recommendations	Modifications
2.4.	What language? English or Thai	2.4. Do the English language barrier hinder them in self-directed learning?

The experts' interview

Semi-structured interview questions about a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand

The interview aims to gather data on finding significant inputs and/ or conditions to develop the constructivist instructional model using Self-Directed and Issue-Based Learning. The data will be collected and analyzed to be guidelines for developing an effective instructional model to empower ESD skills.

The process of designing the semi-structured interview guidelines is as follows.

1.1. Determine the objective of the questions: The questions are designed to study instructional strategies, conditions, supports, and significant inputs from experts to use as guidelines for developing the model.

1.2. Draft the interview guidelines consisting of 5 questions.

1.3. Evaluate the content validity of the questions about language learning in Business Studies by 5 experts. The validity assessment is designed by the concept of the Likert Five Rating Scales to find a mean ($\bar{x}$) and standard deviation (S.D.) for interval data.

Firstly, the experts are given scores from 5 to 1 scales which means

5 = The question item is extremely congruent with the objectives

4 = The question item is very congruent with the objectives

3 = The question item is somewhat congruent with the objectives

2 = The question item is not so congruent with the objectives

1 = The question item is not congruent with the objectives

The scales collected from the experts later are calculated to find the mean ($\bar{x}$) to identify the validity using the below function;

$$\bar{x} = \frac{\sum x}{n}$$

$\bar{x}$= mean of total scores

$\sum x$ = total scores

n = number of experts

The numbers can be interpreted as;

Scale Score	Meaning
4.50 - 5.00	Very High
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
1.00 – 1.49	Very Low

The result shows that $\bar{x}$ varies from 3.8-4.8 and S.D. varies from 0.0-0.98 which means that the questionnaire has high-quality validity and can use to collect the data.

1.4. Modify the questions from the suggestions of the experts. From the evaluation of the content validity, the experts recommended the researcher to modify some points in the questionnaire as shown in *Table 21.*

Table 21 Recommendations on experts' interview questions

No.	Recommendations	Modifications
1	- This item is quite difficult for interviewees to specifically indicate the answer. - Do you mean “accommodating student Characteristics”? - Is it necessary to have the last part of the question?	1. What instructional strategies are most appropriate in terms of objectives (to empower skills for Education for Sustainable Development)?
2	successful learning of…? Could the question be more specific about what kind of learning?	2. What support is needed for successful self-directed learning and issue-based learning?
4	Might this question be re-phrased or made more specific? What type of skills?	4. What level of each skill for Education for Sustainable Development (Self-awareness, Systems thinking, Critical thinking, Integrated problem-solving, and Collaboration) does an individual student need for accomplishing the objectives?
5	Again, which skills? Level of performance	5. What performances and/ or products will reveal evidence of the previously mentioned skills empowerment?

From the Research (R1) part, the processes can be summarized in *Figure 11*.

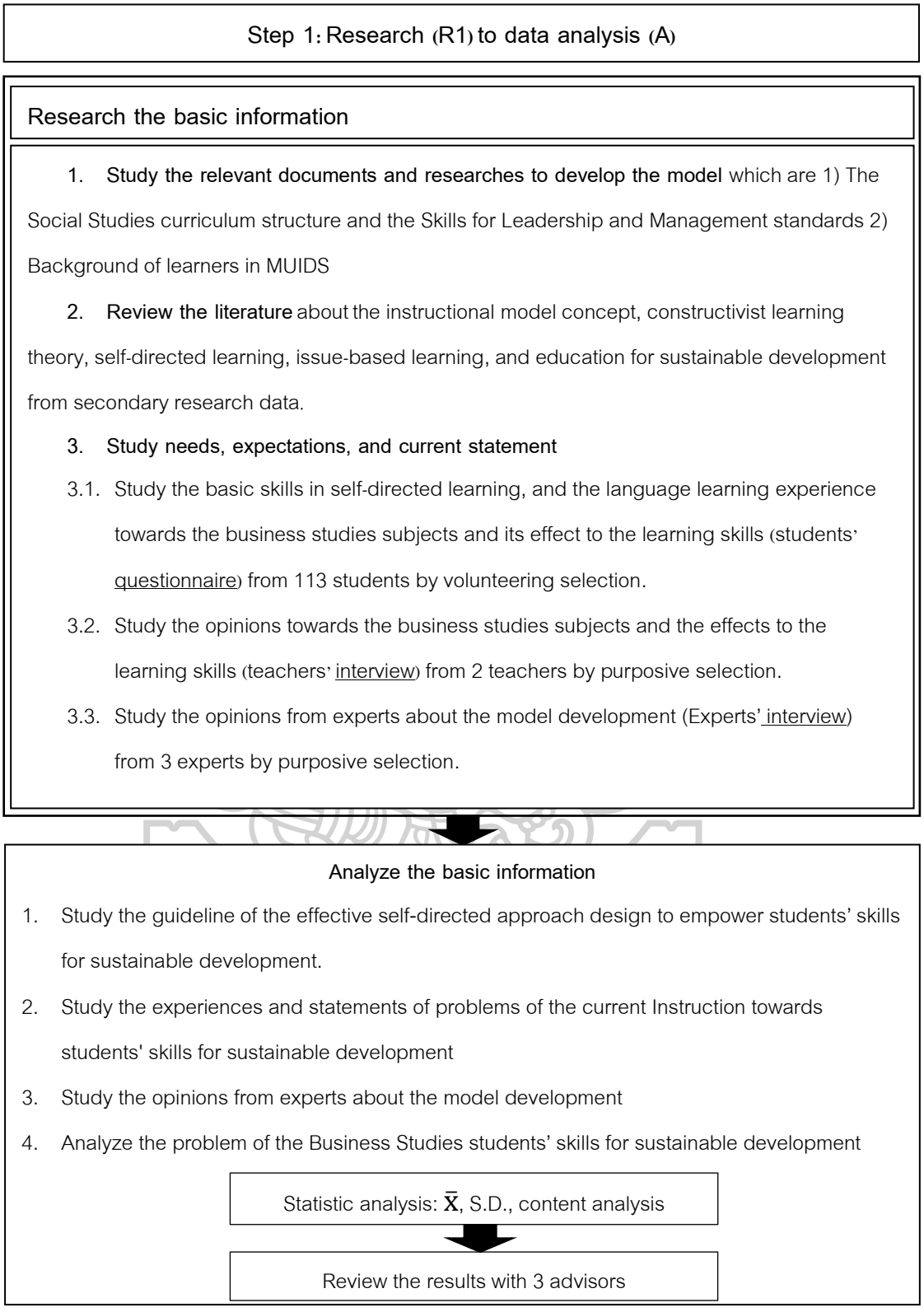


Figure 11 Research (R1) to data analysis (A)

Table 22 The summary of research step R1

Objectives	Methods	Resources	Tools	Analysis	Results
1. To study backgrounds, relevant theories, studies, and research to the model development	Literature Review	Document	-	Content Analysis	The data about the school, curriculum standards, students' backgrounds, and the theoretical concepts of the Instructional model, constructivist learning theory, self-directed learning, issue-based learning, and ESD principles.
2. To study student's self-directed learning readiness	Survey	117 Students	Questionnaire	$\bar{x}$, S.D.	The data to understand the self-directed readiness among students
3. To study student's language learning experience in Business studies toward sustainable development	Survey	117 Students	Questionnaire	Content Analysis	The data to understand student's language learning experience in Business studies toward sustainable development

Objectives	Methods	Resources	Tools	Analysis	Results
4. To study statements and expectations in business studies students	Interview	2 Business Teachers	Semi-structured interview form	Content Analysis	The basic information of the students in their classes to design an effective instructional model in self-directed learning pedagogy.
5. To study the guideline for developing a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand	Interview	3 Experts	Semi-structured interview form	Content Analysis	The guideline for the model development includes significant inputs, supports, and/ or conditions

STEP 2 Development (D1)

In this part, the researcher designed and developed the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.

Objectives

1. To develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand, the model manual, unit plan, and assessment tools for evaluating the effectiveness of the model
2. To evaluate the quality of the developed tools

Resources

Documents

1. The constructivist instructional model uses self-directed and issue-based learning
2. The model manual
3. Skills for ESD evaluation form

Human resources

Seven experts evaluate the quality of 1) the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand 2) The model manual, and 3) The tools to evaluate the effectiveness of the model. The experts are three instructional model development experts, two experts in measurement and evaluation, and two experts in Education for Sustainable development.

Variables

1. The constructivist instructional model uses self-directed and issue-based learning
2. The model manual
3. Unit plan for the Unit 4 M-Business
4. Skills for ESD evaluation form

Methodology

Design and develop the draft of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand, the model manual, unit plan, and the Skills for ESD evaluation form as the tool to evaluate the effectiveness of the model.

1. Study the basic information analysis by both primary data and secondary data research about the relevant studies and theories about skills for ESD and skills for ESD assessment tools.
2. Design the constructivist instructional model which consists of the 1) principle 2) objectives 3) processes 4) measurement and evaluation, and 5) conditions.
3. Design the model manual which consists of 5 parts which are 1) Introduction 2) Fundamental concepts of the model development 3) EDIIIS MODEL 4) Unit plan example, and 5) Evaluation tool example.
4. Design the Unit Plans for the Unit 4. The Unit Plan consists of 10 weeks' plans of a total of 30 hours.
5. Design the Skills for ESD evaluation form. The evaluation form is designed to measure the 5 skills for ESD by using a table containing 5 skills criteria using a 5 rating scale and a blank section for each criterion to list all the pieces of evidence. The criteria are developed from the definitions of each skill. Each skill's score will be calculated on the average score level separately to be interpreted later. There is

also an additional comment part at the end of the form for further commendations and/ or recommendations. The rubrics used the concept of SOLO taxonomy to reflect the levels of skills. The interpretation of the score uses different scales compared to the scale score using a 0.50 interval for tools validation as the scale score for evaluating the effectiveness represents more qualitative data interpretation. Thus, each scale score level contains the same average interval.

The evaluation criteria for the Skills for ESD evaluation form are as follows.

Scale Score	Meaning
4.21 - 5.00	Extended Abstract
3.41 - 4.20	Rational
2.61 - 3.40	Multistructural
1.81 - 2.60	Unistructural
1.00 - 1.80	Prestructural

6. Develop all the drafts and evaluate the quality of the model, the model manual, the Unit Plan, and the skills for ESD evaluation form using the content validation form using the Likert Five Rating Scales to find a mean ($\bar{x}$) and standard deviation (S.D.) for interval data with seven professionals.

Firstly, the experts are given scores from 5 to 1 scales which means

5 = The criteria is extremely congruent with the objectives

4 = The criteria is very congruent with the objectives

3 = The criteria is somewhat congruent with the objectives

2 = The criteria is not so congruent with the objectives

1 = The criteria is not congruent with the objectives

The scales collected from the experts later are calculated to find the mean ($\bar{x}$) to identify the validity using the below function;

$$\bar{x} = \frac{\sum x}{n}$$

$\bar{X}$= mean of total scores

$\sum x$ = total scores

n = number of experts

The numbers can be interpreted as;

Scale Score	Meaning
4.50 - 5.00	Very High
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
1.00 – 1.49	Very Low

The result shows that the developed materials have $\bar{x}$ at 4.46 and S.D. at 0.54 which means that the research tools have high-quality validity and can use to collect the data. $\bar{x}$ varies from 3.71-5.00 and S.D. varies from 0.00-1.03.

Principle: The instructional model integrates self-directed learning and issue-based learning to empower skills for education for sustainable development (ESD) in Business studies, focusing on ESL learners in international high schools.

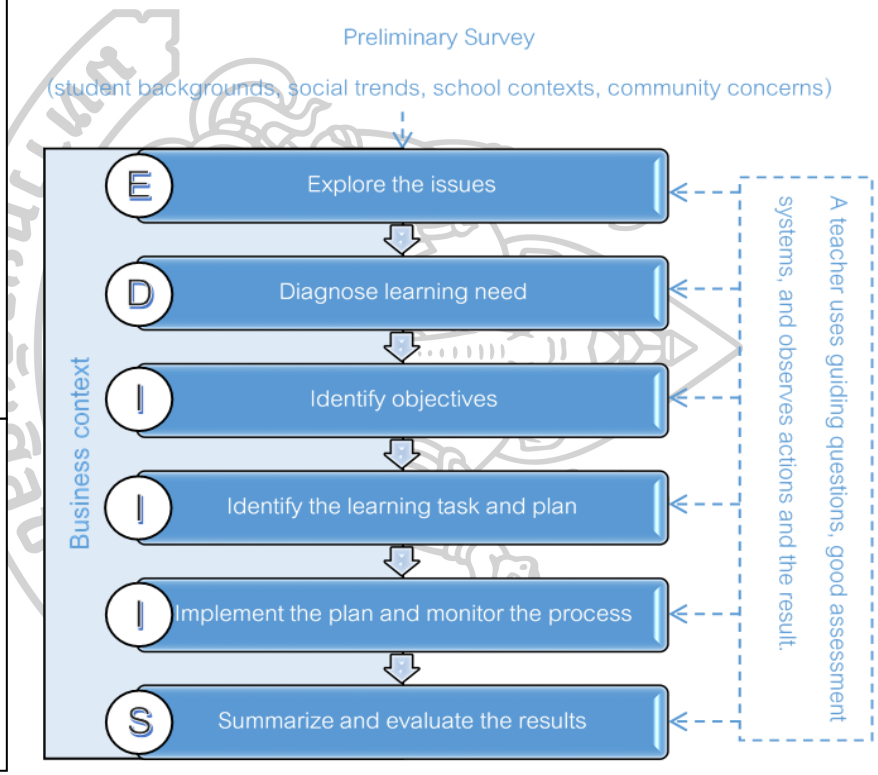
Objective: To empower skills for ESD

EDIIIS processes

1. Explore the issues
2. Diagnose learning need
3. Identify objectives
4. Identify the learning task and plan
5. Implement the plan and monitor the process
6. Summarize and evaluate the results

Measurement and Evaluation

1. Self-awareness
2. Systems thinking
3. Critical thinking
4. Integrated problem-solving
5. Collaboration



Conditions

1. The issues must be relevant to students' context and can influence the students to think more.
2. Students should have at least basic language function skills or an intermediate level of English proficiency.

Figure 12 The draft of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.

From *Figure 12*, the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand (EDIIIS) could be explained as follows.

Principles

The instructional model integrates self-directed learning and issue-based learning to empower skills for education for sustainable development (ESD) in Business studies, focusing on ESL learners in international high schools.

Objectives

To empower skills for ESD

EDIIIS Processes

It consists of 6 steps as follows;

1. Explore the issues

A teacher teaches the fundamental concepts of the learning subject to assist students to explore the issues. Students should brainstorm and prioritize the issues to find what issue is more important to them as a part of a community.

2. Diagnose the learning needs

The teacher motivates students to diagnose their learning needs. The need should relevant and important for the learner and realistic within their social context. It should highlight the gap between the learner's current stage and the goal he/she wants to achieve which can be a personal desire or skill development.

3. Identify the learning objectives

Students specify the objectives of the outcomes. The objectives should be the final outputs of what lastly will be achieved without specifying the methods of learning.

The teacher should empower and motivate students to set goals in learning which enhances the self-motivation of students.

4. Identify the learning task and plan

Students identify the learning task and strategies for each objective. How they propose to accomplish each of them. Students should identify the pieces of evidence, which could be both material objects and human resources that need to be collected to indicate the degree to which students achieved each objective. The verification needs to be provided to specify the specific method of evidence usage in judging each criterion. The learner specifies from the type of objectives that what criteria will vary. Then, students plan on what learning strategies or tools will work best to meet the objectives. They should specify learning resources, evidence of accomplishment, and how the evidence will be validated. Teachers and students can collaboratively design the planning process.

5. Implement the plan and monitor the process

Students execute the plan and monitor their learning. They could ask peers or teachers or seek for experts to consult and give feedback on their learning. This can be done before, during, and after implementing the plan. While monitoring their learning, if the first idea does not work out, students should manage the stress and conflict and should not hesitate to adapt to the learning plan.

6. Summarize and evaluate the results

Students summarize the solution and evaluate the outcomes in the productivity and learning process. In this stage, students should understand how they learn and what learning process affects their learning ability in particular ways. Students evaluate their learning both for meeting learning goals and their learning processes. Furthermore, students should be able to suggest, recommend, or plan for future usage.

The EDIIIS model focuses on the business studies students so a teacher can emphasize the use of business context while implementing the model. A preliminary survey allows the teacher to understand student backgrounds, social trends, school contexts, or community concerns which enables effective lesson planning to meet the student needs and social needs. Moreover, the teacher can use guiding questions and good assessment systems such as checklists, worksheets, or rubrics to allow students to monitor their learning better. The teacher can also observe actions and the result during the student's self-directed learning to assist student learning such as giving useful feedback or supporting them so they are confident to improve themselves.

Measurement and Evaluation

There are 5 skills for ESD as follows.

1. **Self-awareness** refers to the capacity to reflect the perceived experiences within a multidimensional phenomenon and to be aware of personality traits, goals, emotions, attitudes, preferences, intentions, etc to move to action in the future. at the same time. The self-awareness in ESD addresses the reflection on one's role in a community that shares the values and principles underpinning sustainable development and society so one can set visions and plans for the future. It should meet the following criteria.
    1) The ability to be aware of one's need by reflecting on his/her role in society
    2) The ability to create a clear and valuable vision, and plan for the future
    3) The ability to move from awareness to knowledge to action.
    4) The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
2. **Systems thinking** refers to the capacity to see the big picture of a whole system in complex relationships and understand its dynamic interactions and feedback loops

that characterize complex adaptive systems. To synthesize various concepts, systems thinking in ESD addresses how a person recognizes, links, and synergizes embedded relationships while finding the solutions to problems. It should meet the following criteria.

1) The ability to recognize and understand relationships in a whole picture
2) The ability to analyze and synthesize embedded relationships among them

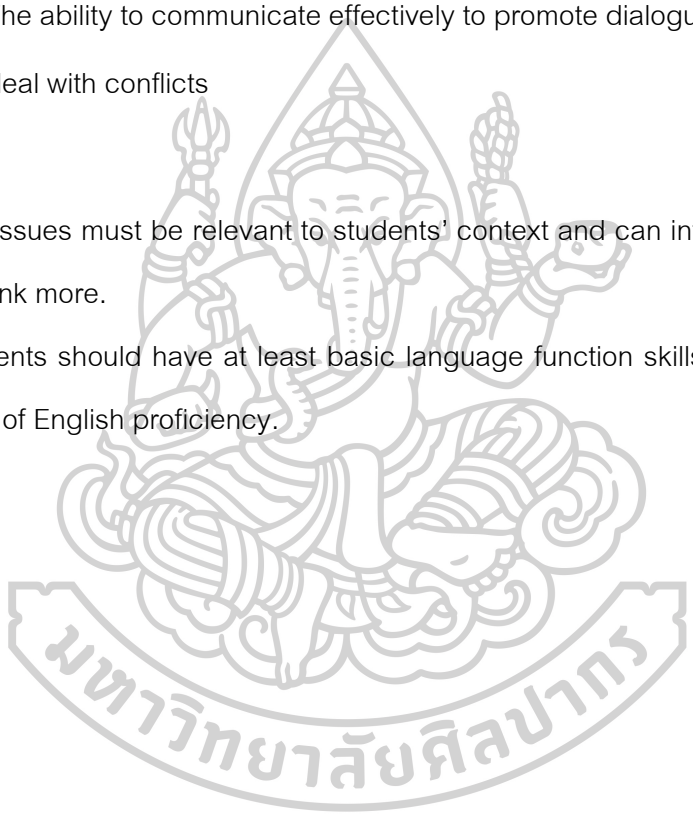
3. **Critical Thinking** refers to the capacity to think logically and cognitively by acquiring adequate knowledge and evidence to determine, distinguish, recognize, select, evaluate and present assumptions. The critical thinking in ESD should address the value issues, dilemmas, and challenges of sustainable development to meet the following criteria.
    1) The ability to question current norms, practices, opinions, and beliefs
    2) The ability to recognize the assumptions underlying our understanding, views, and opinions
    3) The ability to reflect on one's values, perceptions, and actions
4. **Integrated problem-solving** refers to the capacity to use knowledge and experiences to apply various methods to solve a problem. The integrated problem-solving in ESD addresses how a person can apply various skills, and different innovative solutions to model the learning process and solve the problem and challenges of sustainable development. It should meet the following criteria.
    1) The ability to apply different problem-solving frameworks to complex problems
    2) The ability to develop and implement innovative solution options
    3) The ability to use various processes in learning
5. **Collaboration** refers to the capacity to work as a cross-sector partnership to generate shared values to cooperate with social responsibility. The collaboration in

ESD addresses the ability to collaboratively work with others by understanding and respecting others regarding different needs, perspectives, and actions. It allows a person to effectively communicate and use interpersonal skills with others, and also deal with conflict in a group smoothly. It should meet the following criteria.

1) The ability to participate in the group decisions
2) The ability to learn from others
3) The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts

Conditions

1. The issues must be relevant to students' context and can influence the students to think more.
2. Students should have at least basic language function skills or an intermediate level of English proficiency.



7. Reassess and modify the model and the model manuals from the experts' recommendations.

No.	Issue	Recommendations	Modifications
1.	Name of the model	- Consider if the name can be shortened as the constructivist and the self-directed learning might be partly overlapped. - Should it be “for” not “in” Business Studies?	None. According to the English grammar, the current writing is correct and the name cannot be shortened as the concepts show different ideas to be integrated into the model.
2.	Fundamental concepts of the model development	- The relationship of each theory that leads to the model should be explained clearly. - Do not mention the problem, but focus only on the origin of the creation of the model that is created. - Remove the instructional model concept part	- Added more writing to the end of each concept to link each other ideas more - Removed the problem part - Removed the instructional model concept part - Changed the design of Figure 1 to present the linking concepts better
3.	Model Principle	- There should be a link to the main principles of the theory that lead to the principle of the model.	- Edited the new principle to reflect the concept of the constructivist, self-directed, issue-base, and ESD concepts so they are consistent.
4.	Model Objective	- Add the five sub-objectives to the main one, but keep them concise. - The target group should also be identified	- Revised the objective to be “To empower skills for ESD in business for international high school students in Thailand.”

No.	Issue	Recommendations	Modifications
5.	EDIIIS processes	- Write the objectives of each step and separate the roles of teachers and students - Write a description of the concept of each step to reflect the Constructivist more. - Should the model image be seen as a connected circuit from S back to E or not? - Six large steps may be too long; can the "I" merge into 1? - There are also some considerations for leading to sustainable development.	- Wrote a detailed description of each step to clarify the roles of teachers and learners, and reflect the concept of constructivism more. - Added arrows in the model to link from the last step back to the first step to highlight the Sustainable Development concept. - The six steps of EDIIIS were not modified because each I step has a different meaning and the elements are clearly shown when described in detail.
6.	Measurement and Evaluation	- Should focus on assessment to improve learners' learning by using various methods e.g. differentiation and authentic assessment - There are observations in measuring and evaluating dependent variables. The tools and criteria should be adjusted to be practically feasible to ensure the reliability of research results.	- Added details that teachers should use a variety of assessments based on differentiation and be authentic. - Revised the assessment to make it more practical and measurable based on the concept of solo taxonomy. There are academic principles to support later interpretations.

No.	Issue	Recommendations	Modifications
7.	Conditions	- Should the issue be current? - Is an English proficiency level required? - May consider the basic skills of teachers, the availability of media, technology, and support at the policy level. However, if the model is implemented, it may be corrected later. - Consider the arrangement of the learning atmosphere.	- Add that the current issue should be selected. - The language factor is retained because the language skills criteria of all international schools are uncertain. - Other factors will be added gradually after the implementation step.
8.	Model Manual	- Add an introduction and guidelines. - Various assessment forms should be added to the documentation to make it a more complete guide.	- Added suggested parts - Assessment tools can be designed up to teachers so they are not included. There is a written representation of each step in the sample

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8. Reassess and modify the unit plans from the experts' recommendations.

No.	Issue	Recommendations	Modifications
2	Tasks	- Focus only on student parts and each week's tasks should match the content - Designing tasks with the characteristics of knowledge integration leads to the creation of innovations that are consistent with learning standards. which will be more reflective of constructivism	Revised the tasks as suggested to match the content for each week and standards.
3	Assessment and Evaluation	- The pass percentage should be set in the evaluation criteria. - The evaluator should also be a student and peers to provide a variety of assessments and self-assessments. - The score should be formative rather than summative.	- Fixed the rubrics and scores from 4 to 5 levels based on the Solo taxonomy criteria. - Include students and peers to assess ESD skills alongside teachers to provide reliable, multidimensional results.
4	Learning activities	- No need for detail for each step - Set content as a primary row - If possible, it should be demonstrated when each stage is completed. What skills will children develop in the 5 characters?	Revised as suggested to not present the detail in the table.
5	Learning materials and learning resources	- Write learning materials within the learning activities table - Include details about the important online learning resources that learners will go to for self-learning. This will show that the learning design has planned useful learning resources, and can effectively stimulate learners' learning	Added example learning materials but did not add them to the table of the learning process as children may use different learning materials according to the nature of the tasks assigned in each learning process.

9. Reassess and modify the skills for ESD evaluation form from the experts' recommendations.

No.	Topic	Recommendations	Modifications
2	Systems thinking The ability to recognize and understand relationships in a whole picture	It should recognize and understand separately? Read more of systems thinking's definitions from other sources to design the rubrics	Have not edited the criteria as the researcher used the exact sentence used from the study of the concept.
	The ability to analyze and synthesize embedded relationships among them	Should analyze and synthesize separate according to Bloom's taxonomy?	Have not edited, same as the above explanation.
3	Critical thinking The ability to question current norms, practices, opinions, and beliefs	Read more critical thinking concepts to design the rubrics.	Designed the rubrics based on suggestions.
5	Collaboration The ability to participate in the group decisions	Should we add sharing and respect values?	Have not added the suggested values according to the synthesized ESD concept does not present the words.
	The ability to learn from others	Too broad	Write it more specifically
	The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts	Read more of the collaboration concept to design the rubrics.	Designed the rubrics based on suggestions.

No.	Topic	Recommendations	Modifications
6	Overall appropriateness: the form is appropriate that can be used to measure and evaluate the actual results consistent with the principles, objectives, and instructional model	- Change the level order to 4 3 2 1 - Have student name section, but remove when present the results - Add evaluator name - Apply the Solo taxonomy concept to write the rubrics as it can be measurable and be supported by studies. - Should each indicator be weighted differently? - Consider who can use the form - According to solo taxonomy, there are 5 levels.	- Changed the score level to 5 4 3 2 1 to meet the criteria from the solo taxonomy concept. - Have not added the student name as suggested by the IRB reviewers - Made score calculation to be average by 5 points equally for each skill - Have teacher, students, and peers be evaluators.

Tools

Content validation form

From the Research (R1) part, the processes can be summarized as follows.

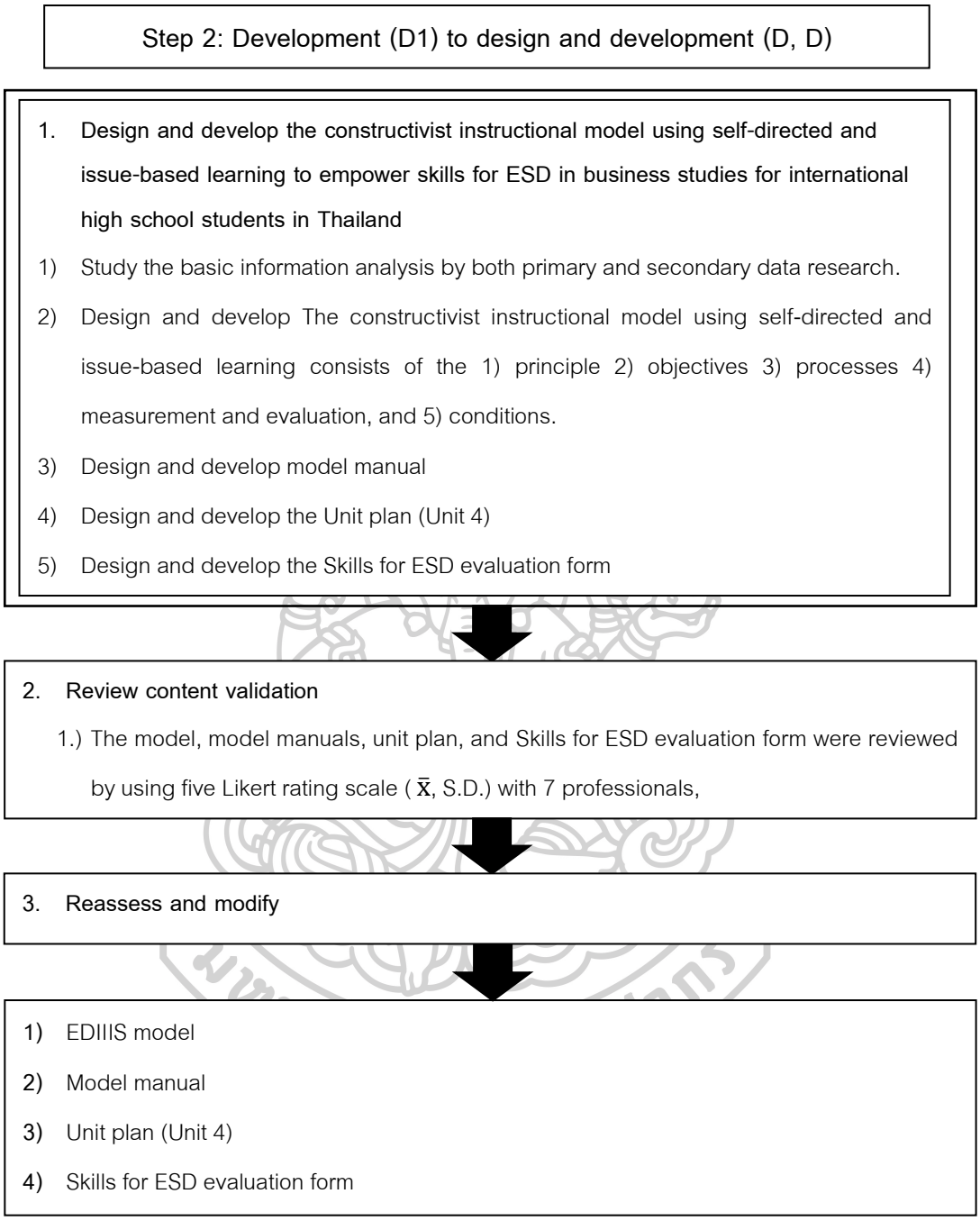


Figure 13 Development (D1) to design and development (D, D)

Table 23 The summary of research step D1

Objectives	Methods	Resources	Tools	Analysis	Results
1. To develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand, the model manual, unit plan, and assessment tools for evaluating the effectiveness of the model	Use the data obtained from the R1 stage to design and develop the model and tools	Data from R1	-	-	1. The constructivist instructional model uses self-directed and issue-based learning 2. The model manual 3. Unit plan for the Unit 4 M-Business
2. 2. To evaluate the quality of the developed tools	Evaluate the model quality (content validation)	7 experts	Content validation form	$\bar{x}$, S.D.	The developed materials have $\bar{x}$ at 4.46 and S.D. at 0.54 which means that the research tools have high-quality validity and can use to collect the data.

STEP 3 Research (R2)

In this part, the researcher implements the constructivist instructional model using self-directed and issue-based learning to the sample groups of Mahidol University International Demonstration School's Business Studies students in the Skills for Leadership and Management classes.

Objectives

To implement the constructivist instructional model using self-directed and issue-based learning.

Resources

The sample consists of 12th-grade students in the Skills for Leadership and Management 12B1 class of 2021. There are 24 students in total. The researcher used cluster random sampling from ten business elective classes. The subject is available as an elective with no prerequisites. The sample is homogeneous, with participants drawn from a variety of core classes and educational backgrounds.

Methodology

1. Preparation
    1.1. The researcher used cluster random sampling from ten business elective classes.
    1.2. The teacher selects to review the content and objectives of UNIT 4 M-Business.
    1.3. Review the objectives of using the constructivist instructional model using self-directed and issue-based learning. The teacher informs the students about the role of the teacher and students in the self-directed learning project. The teacher advises on how to use peers and teachers as resources, motivates students, and guides them to work on the project. The rubrics and assessment tools are also provided and explained clearly.

2. Implementation

The researcher as a teacher implements the constructivist instructional model using self-directed and issue-based learning. The students applied to work in five departments (Production, Public relations, Human resources, Finance, and Marketing) and a presidential role to create and run a business. There are unequal numbers of employees in each department as it relies on how the students applied and elected to work in the departments as well as the company's agreement. There is one president, five members in Production, five members in Public Relations, four members in Human Resources, three members in Finance, and five members in Marketing. Each department work in different roles with various responsibility so they have to also work with different form and materials. It took 10 weeks to complete the implementation.

The implementation plans are designed as follows.

Table 24 The research implementation plans

Research Objectives	Plans	Data Analysis
1.) To study the students' skills for ESD after using the instructional model with self-directed learning pedagogy.	The One-Shot case study X O X is the instructional model implementation O is the Effectiveness of the model evaluation study	Evaluate the effectiveness of the skills for ESD of the samples ($\bar{X}$, S.D.) and analytical analysis

3. Data collection

3.1. The researcher as a teacher observes students' performances and collects learning outcomes while the students work on various tasks and assignments during the project. The observation note is based on five skills criteria and will be recorded week by week for each department. The researcher has been

teaching in the school for 8 years in the business studies subjects field. The researcher has strong experience in-class observation and is professional in students' evaluation as being a class observer for other subjects, an evaluator for other classrooms' projects, a judge for various school events, and also an evaluator for new students' admission. The researcher was trained to use effective tools to evaluate student performance from a few professional development programs.

3.2. Each student uses the skills for ESD evaluation form to do self-evaluation as the teacher explained how to use the rubrics clearly. The evaluation takes place after the project finishes completely.

From the Research (R2) part, the processes can be summarized in *Figure 14*.

Step 3: Research (R2) to implementation (I)

1. **Preparation**
   1) Select samples from business elective clusters
   2) Review content and objectives of the UNIT 4

2. **Implementation**
   One- shot case study design to study the effectiveness of the constructivist instructional model.

3. **Data collection**
   1) Teacher observes student's performance during learning and takes notes.
   2) Each Student uses the Skills for ESD Evaluation Form to evaluate self-performance.

Figure 14 Research (R2) to implementation (I)

Table 25 The summary of research step R2

Objectives	Methods	Resources	Tools	Analysis	Results
To implement the constructivist instructional model using self-directed and issue-based learning	The researcher uses the model developed from the D1 stage to implement in the classroom for 10 weeks, using unit 4 content. The researcher also observe students' performances during learning	24 students in the Skills for Leadership and Management 12B1 class of 2021.	Model	Content-analysis,	1) Teacher observes student's performance during learning and takes notes. 2) Each Student uses the Skills for ESD Evaluation Form to evaluate self-performance.

STEP 4 Development (D2)

The researcher assesses the effectiveness of the constructivist instructional model using self-directed and issue-based learning in this section. Its goal is to assess how the model affects students' ESD skills.

Objectives

To evaluate the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills

Methodology

1. Collect data from the teacher's observation note and student's self-evaluation using the skills for the ESD evaluation form.
2. The qualitative data collected from the teacher's observation, students' evaluations, and various pieces of evidence collected in the classroom to be used as evidence were also reviewed together with 3 advisors to avoid bias.
3. The researcher evaluates the effectiveness of the model by finding the mean ($\bar{x}$) and standard deviation (S.D.) to interpret the data together with linking evidence.

From the Development (D2) part, the processes can be summarized in *Figure 15.*

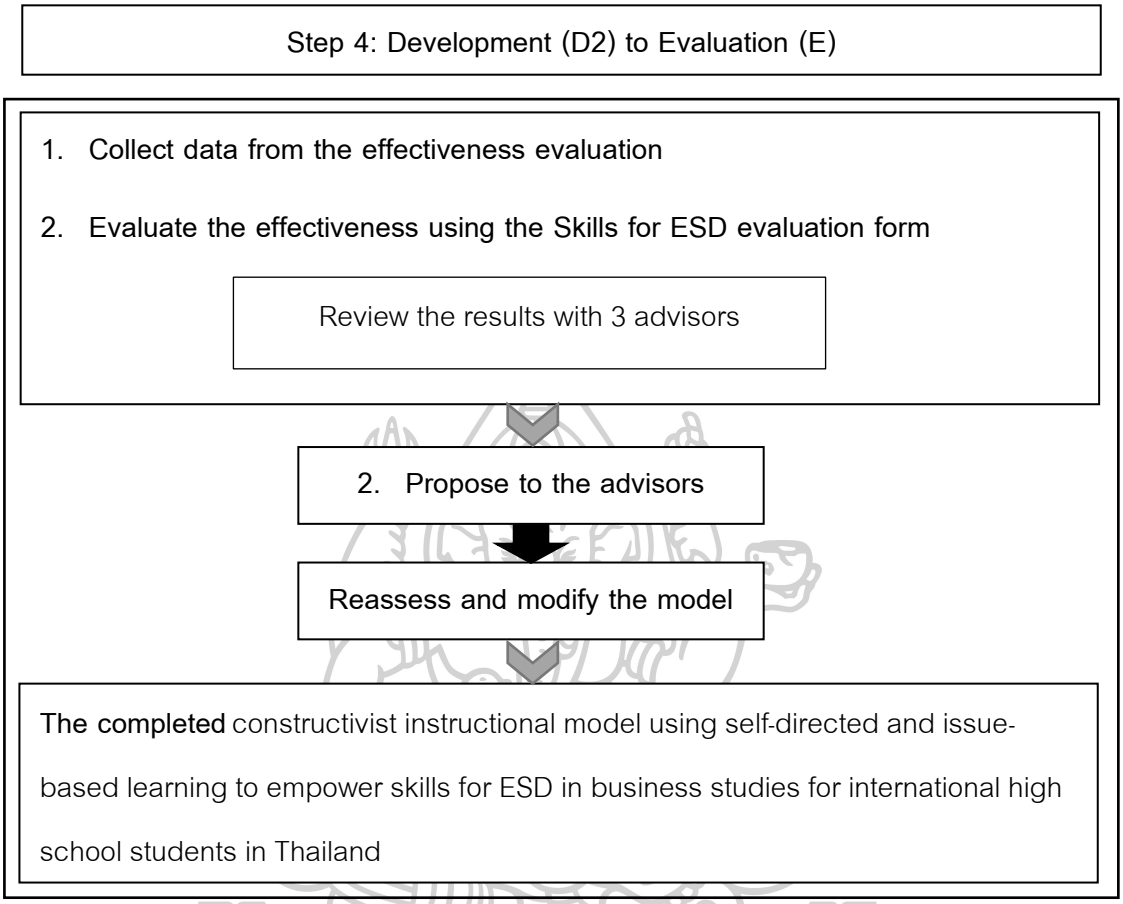


Figure 15 Development (D2) to Evaluation (E)

Table 26 The summary of research step D2

Objectives	Methods	Resources	Tools	Analysis	Results
To evaluate the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills	Evaluate the effectiveness of the model by collecting data from the teacher's observation notes and students' self-performance evaluation and evidence for learning outcomes from the previous research step R2 that have been reviewed by three advisors already.	1. Observation note 2. The skills for ESD evaluation form.	Model and classroom materials	$\bar{x}$, S.D.	The results of the effectiveness of the model implementation and levels of each skill

Chapter 4

Findings and Data Analysis

The research on the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand has objectives as follows.

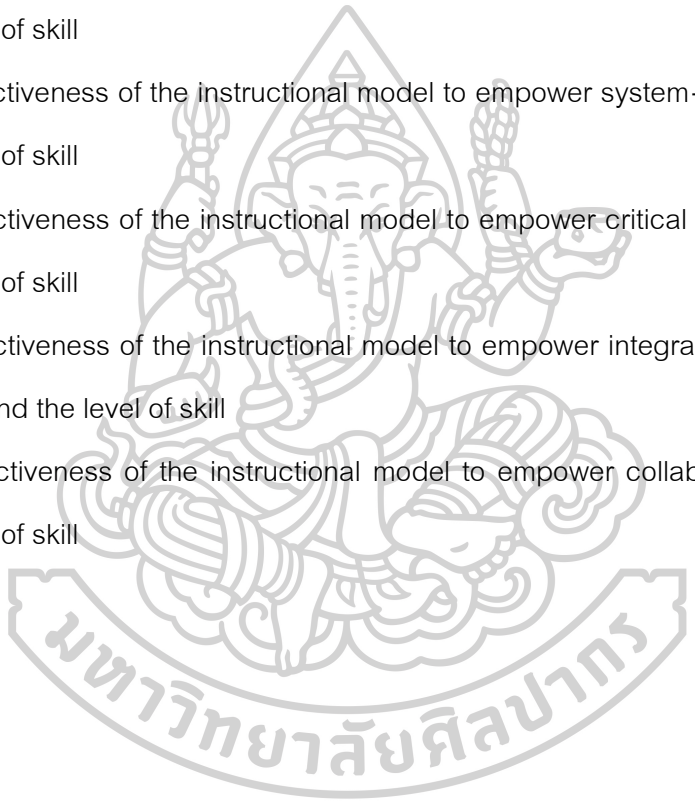
1. To study and develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.
2. To study the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills
    2.1. To study the effectiveness of the instructional model to empower self-awareness in ESD and the level of skill
    2.2. To study the effectiveness of the instructional model to empower system-thinking in ESD and the level of skill
    2.3. To study the effectiveness of the instructional model to empower critical thinking in ESD and the level of skill
    2.4. To study the effectiveness of the instructional model to empower integrated problem-solving in ESD and the level of skill
    2.5. To study the effectiveness of the instructional model to empower collaboration in ESD and the level of skill

This research is designed by using the Research and Development (R&D) methodology and mixed methods research of embedded design on both quantitative and qualitative methods. The findings are interpreted in two parts.

Part 1: The findings of the study and the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand. (EDIIIS model)

Part 2: The findings of the effectiveness of the EDIIIS Model

1. The effectiveness of the instructional model to empower self-awareness in ESD and the level of skill
2. The effectiveness of the instructional model to empower system-thinking in ESD and the level of skill
3. The effectiveness of the instructional model to empower critical thinking in ESD and the level of skill
4. The effectiveness of the instructional model to empower integrated problem-solving in ESD and the level of skill
5. The effectiveness of the instructional model to empower collaboration in ESD and the level of skill



Part 1: The findings of the study and the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand. In this part, the researcher presents the findings and data analysis in two components which are 1) The finding of the study the basic information to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and 2) The finding of the EDIIIS model development. The findings of the study and development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand show that UNESCO has declared that the Education for Sustainable Development (ESD) is the education goal for the 21st Century since 1997 to meet the globalization. The 5 ESD skills are 1. Self-awareness 2. Systems thinking 3. Critical thinking 4. Integrated problem-solving, and 5. Collaboration. There are six learning steps to promote ESD which are: 1. Explore the issues 2. Diagnose learning needs 3. Identify objectives 4. Identify the learning tasks and plans 5. Implement the plan and monitor the process, and 6. Summarize and evaluate the results (EDIIIS processes). The detail of the findings is shown below.

1. **The findings and analysis of the study basic information to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand**

Human resources data were collected from students, teachers, and experts. The findings are presented as follows.

1.1. The study of the student's self-directed learning readiness in Business studies toward sustainable development

The students' self-directed learning readiness results were collected by the rating scale questionnaire which is conducted online among 113 participants. The data collection was calculated to find the mean ($\bar{x}$) and standard deviation (S.D.).

The result shows that the mean ($\bar{x}$) varies from 2.95 to 4.18 and the standard deviation (S.D.) varies from 0.57 to 1.00. There is no "very high" level item about students' self-directed readiness. However, 14 items are at a "High" level. There are 3 items with a moderate level. The high-level items illustrate that the students have quite high self-directed readiness such as recognizing their needs, knowing how to plan, and seek for help (Items 1, 3, 4, 6, 7, 8, 14, 15, and 17). However, However, some high items show that students sometimes still need the teacher's support and guidance (items 9, 10, 11, 12, and 16). The moderate items illustrate that some students require more empowerment skills to link their academic goals and personal goals and work by themselves. Some of them somewhat rely on the teacher's guidance primarily when they don't understand something. The results show in table 22.

1.2. The study of the student's language learning experience in Business studies toward sustainable development

The students' language learning experience results were collected by the rating scale questionnaire which is conducted online among 113 participants. The data collection was calculated to find the mean ($\bar{x}$) and standard deviation (S.D.). Then, the numbers will be interpreted to find the meaning of the student's language learning experience as follows.

The results show that mean ($\bar{x}$) varies from 3.40 to 4.38 and the standard deviation (S.D.) varies from 0.57 to 1.14. It can be analyzed that the students are likely to be able to work in a self-directed methodology. They know how to identify the learning needs pretty well of why they are important to their life or

communities but moderate level on the connection of the coursework to their personal goals or interests. Regardless they are highly engaged in learning due to the grade requirements for the course, the students are likely to be motivated when they can choose their topics too as some of them are eager to learn extra to develop their work if they are interested in the topic. However, the outcomes might be better if the students are clearly instructed on what they are needed to do or complete. They know who or how to find more information to assist them in working. Somehow, there are quite equal numbers of students who prefer to take initiative to learn on their own and those who depend on the teacher to guide or lead them. They sometimes stress when they are struggling with self-directed learning, but they said teachers and peers can help them pretty much. They are pretty confident in their learning and satisfied to see the outcomes matched to their expectations.

The students' language learning experience in Business studies towards sustainable development is collected by the rating scale questionnaire which is conducted online among 113 participants. The data collection is calculated to find the mean ($\bar{x}$) and standard deviation (S.D.). Then, the numbers will be interpreted to find the meaning of students' language learning experiences.

The data shows that there is no "very high" level. 11 items are at a high level (items 1-6, 8, 10-13). It shows that students have high experience in using English languages to learn. They normally use English to communicate, acquire, and express ideas effectively. Two items are at a moderate level. It shows that they somewhat find writing and can express ideas than speaking or struggling in expressing ideas in writing format.

It can be analyzed that students can use English to express ideas at a proficiency level. They can use English to communicate in many ways including

acquiring information and expressing ideas. They can search for extra information when they do not understand or clarify things before hands by themselves or peers' assistants. They can use English and can translate it into their native language or use nonverbal communication when they cannot think of the right ways to express their ideas. One-third of them agree that speaking helps them to express ideas better along with nonverbal communication.

The additional comments towards the question" Do language learning affect the critical thinking while working in the Business Studies classes? If yes, please explain how." are separated into 2 sides Some examples of the students' comments on finding that language learning does not affect the learning ability

"No, because I use English since I was a kid"

"No, because business is all about strategies."

"no, because I can understand easily"

Some examples of the students' comments on finding that language learning affect the critical thinking

"Yes, because maybe there are some business terms which I do not understand"

"Yes, if you don't know that particular language well, it is very difficult to reach a certain understanding of the topics covered in class."

"Yes, because some word has a specific meaning in business so sometimes it will make confusion in understanding."

1.2.1. The study of expectations on Business Studies students' skills

The results were collected from interviewing two Business Studies teachers. The results were collected as follows.

Table 27 Data of the Self-directed learning readiness of Business Studies students and the expectations on Business Studies students' skills

Interview questions	Teacher 1	Teacher 2	Summary
1. What are the objectives of having the self-directed projects in your class? Why?	Students can learn the learning skills; the ability to research and teach themselves.	1. Students are going to know how to research. 2. Students can be more creative about the material, the type of material they certainly want, how they do research, and how they work. 3. Students can decide what's the key points what's important.	1. Students can learn how to learn and/or research by themselves. 2. Students can be more creative in designing their learning. 3. Students can learn what is important to them.
2. How do students take initiative and responsibility in their learning?	Students need direction from a teacher. The teacher must scaffold students to learn.	Teachers give them a lot of instructions that should be the ones students are into so, they can research extra by themselves.	1. A teacher gives direction and scaffolds students to learn. 2. The teacher provides clear instructions that students can research extra by themselves.

Interview questions	Teacher 1	Teacher 2	Summary
3. What motivates students to learn and engage with new material?	1. To raise extrinsic motivation through honestly great design grading rubrics around the subject. 2. The other motivation, which is insurance, is for the students to choose the topics that they are interested in.	Students should be allowed to work in their own styles, including how they conduct research and complete the project, as well as their final products. So they can work, and each team can work, depending on their style.	1. Well-designed grading rubrics 2. Students can select topics. 3. Students work in their styles.
4. How do students develop their self-directed learning while working on a project?	Some students simply work on their daily journals, which a teacher uses to observe actions, without actually learning the process, and they never take that learning process seriously. As a result, the teacher must assist and guide the student in making effective use of the journals for them to grow.	Weak students typically seek assistance from teachers when they are struggling, whereas strong students only require teachers to reassure them of the quality of their work.	1. Students may use journals to evaluate their performance along with effective teacher guidance. 2. Weak students usually ask teachers to assist them when they are struggling, while strong students only need teachers to reassure the quality of their work.

Interview questions	Teacher 1	Teacher 2	Summary
5. What barriers hinder the students in self-directed learning?	1. Sometimes, students are just doing the work because they were told to. They don't actually learn the process, and they never take that process of learning until they apply it to other things. 2. Language barriers can sometimes be problems. Students might take a longer time to understand the vocabulary	Some students could struggle with learning individually when some contents are very difficult.	1. Lack of motivation. 2. Language barriers 3. Struggling to learn some complex concepts while learning individually
6. How does self-directed learning empower the students to be lifelong learners?	A teacher can allow for different levels of grading and it can make learning specific for students. It's flexible.	The method is comfortable for students that allow them to do the work outside the classroom which can be seen from their reflective process journal.	1. Allow differentiation in learning 2. Students can always learn by themselves when they encounter a problem. 3. The reflective process helps students keep learning both in and outside the classroom.

Interview questions	Teacher 1	Teacher 2	Summary
7. How does self-directed learning empower the students to be lifelong learners?	1. It allows for different levels of grading and it can make learning specific for students as well. 2. Students can do their learning or researching, if want, as long as you work on your reflections because it's more flexible. 3. Students have different language abilities, which is basically differential differentiation.	Students can keep learning both in and outside school as they might be encouraged by peers.	1. Allow differentiation in learning 2. Students can always learn by themselves when they encounter a problem. 3. The reflective process helps students keep learning both in and outside the classroom.
8. What are the expectations of Business Studies students' skills for Education for Sustainable Development?	Students find the right methods for solving specific things.	1. Interpret the academic learning in the real world 2. Students use their thinking skills to learn	1. Students find the right methods for solving specific things. 2. Students interpret academic learning in the real world. 3. Students use their thinking skills to learn.

Interview questions	Teacher 1	Teacher 2	Summary
9. How can teachers assist students in developing the skills for Education for Sustainable Development?	1. A teacher just gives them lots of practice such as work problems, and case studies so they have to do every type of assignment. 2. Sometimes, it's very difficult, the teacher might want to give them an example.	1. Giving them information 2. Ask them some awesome questions and made them think about information not just repeat it. 3. Give them examples that don't quite fit with the pattern or expected so that it makes them think a little bit. And I use real-life examples a lot.	1. Have students practice a lot 2. Give examples 3. Use guiding questions

The results found that the main reasons teachers use self-directed learning in their classrooms are from two main reasons. Firstly, it is a way to have students learn how to learn, how to research by themselves. Secondly, students can plan their own studies to know what is important to them. However, it is challenging for the students to take initiative and responsibility in their learning, as some of them are new to this learning style and highly get used to relying on teachers. To have students select a topic they are interested in and well-designed instructions and rubrics can support this situation.

For motivation, the students learn with more joy when they can select their topics and use their strengths in the work. They can also be motivated by clearly designed grade rubrics and instructions. The teachers found that students need good guidance in the initiative parts and can ask their peers or teachers when they are struggling.

Meanwhile, the teachers notice that some are struggling in understanding languages too, but self-directed learning is good for these students. One teacher said, he thinks that the self-directed project is good for differentiation techniques. It gives them opportunities to mix the ability of learning where they found suiting them most. Students can design their ways of learning even using their native language to assist them while researching for information but lastly, they will have to interpret their language which encourages them to think more.

Teachers can also scaffold the students for better comprehension. Self-directed learning is one flexible way of skills empowerment. The expectations of teachers for the Business Studies students' critical thinking skills are quite similar in terms of real-life relations. Teachers said they are focusing more on the usage of applying knowledge in a real-life situation. Teachers use a lot of case studies

and simulations to scaffold them in developing their learning skills. The self-directed projects are chosen as it is a good way to have the student develop various skills while working on the familiar topic of their choices and learning styles.

2. The study of the guideline of a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand from experts.

The data was collected from interviewing 3 experts from the relevant fields to the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand. The results were collected as follows.

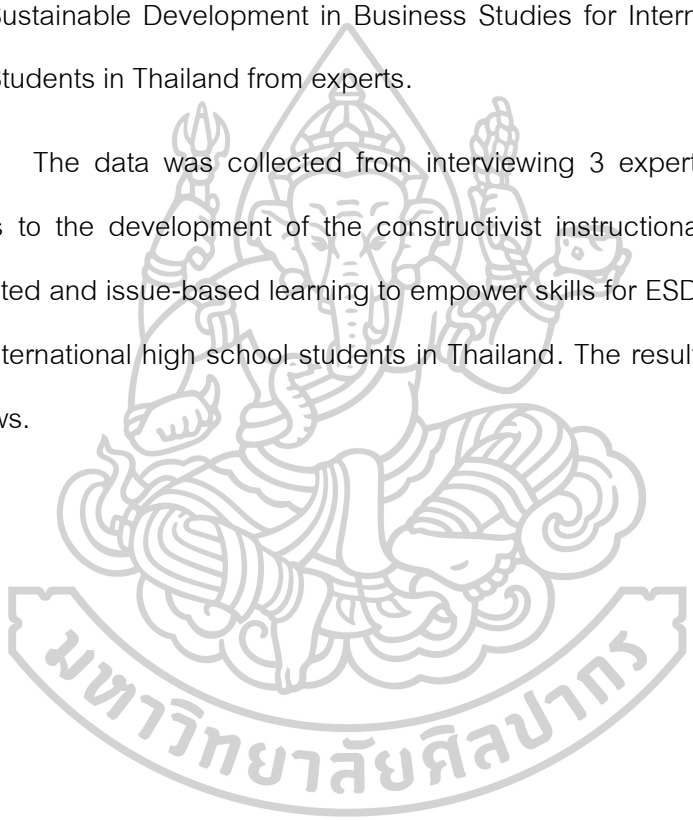


Table 28 Data of the experts' guidelines of a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand

Questions	Expert 1	Expert 2	Expert 3	Summary
1. What instructional strategies are most appropriate in terms of objectives (to empower skills for Education for Sustainable Development)?	1. Knowledge development 2. Empowerment 3. Network 4. Follow-up and evaluation for sustainability	1. Active learning 2. Other learning strategies such as participatory learning, problem-based learning, learning based on sustainable development issues in society, and project-based learning	1. Cooperative learning and Group discussion 2. Differentiation and Independent study 3. Student-centered: problem-solving, discovery learning, reflection 4. Graphic organizers 5. Simulations or Roleplaying	1. Knowledge management 2. Student empowerment 3. Networking 4. Follow-up and evaluation for sustainability 5. Active learning 6. Various student-centered learning strategies such as cooperative learning, differentiation, Graphic-organizers, and simulations 7. Differentiation and Independent study

Questions	Expert 1	Expert 2	Expert 3	Summary
2. What support is needed for self-directed learning and issue-based learning?	1. Facilities are places. 2. Integrated teaching 3. Filling the gap that corresponds to the background of the learner by studying the learning needs prior. 4. Teach students to understand and accept themselves. What is taught must be useful to the learner. 5. Teaching stimulates practical skills. 6. Leaning emphasizes sustainability.	1. The guideline can be both for the learning process and for the thinking process. 2. The instructor should be a facilitator to facilitate learning. 3. Encouraging students to always review their learning and make reflections, which will help learners gain a deeper understanding.	1. Study and organization skills 2. Language proficiency 3. Use of technology 4. Prioritize critical thinking	1. Facilities 2. Integrated teaching 3. Fill students' gap 4. Learning must be useful and emphasize sustainability 5. Teaching stimulates practical skills 6. Effective guidelines 7. Teachers inspire and encourage students 8. Study and organization skills 9. Language proficiency 10. Use of technology 11. Prioritize critical thinking skills

Questions	Expert 1	Expert 2	Expert 3	Summary
3. What conditions should be present to use the constructivist instructional model using Self-Directed and Issue-Based Learning?	1. The issues should stimulate deep and rounded thinking skills. 2. The teacher must be a model. 3. The budget	1. Teachers must have an open attitude towards learning management. 2. Design instruction in awareness of the learner's context. 3. Linking the subjects used in the study is an issue where students can relate to real situations.	1. Students are highly motivated; proactive learners 2. Students need an intermediate level of English proficiency. It is needed because it's the expression of learning. If they want to express their understanding, they should have at least basic language function skills. 3. Teachers provide samplers, checkpoints, and rubrics. 4. School encourages the use of "constructivism".	1. The issues must be relevant to students' context. 2. Students should have basic language function skills. 3. The school provides learning support and a good learning environment. 4. Students are highly motivated. 5. The school encourages the use of "constructivism".

Questions	Expert 1	Expert 2	Expert 3	Summary
4. What level of each skill for Education for Sustainable Development (Self-awareness, Systems thinking, Critical thinking, Integrated problem-solving, and Collaboration) does an individual student need for accomplishing the objectives?	It should focus on the knowledge literacy and communication literacy that are the core of learning.	Self-awareness should be the first skill promoted. Next, systems thinking and critical thinking can meet just good or fair levels. Integrated problem-solving should be similar. Finally, collaboration is the same.	Level: HIGH. A high level in each skill means better work output. The model is really intensified. it doesn't matter whether it's high or low but at least they know how their skills are categorized. Whether they are low or very high, or even outstanding.	A high level for all skills should be the best. However, self-awareness is the skill to be prioritized.

Questions	Expert 1	Expert 2	Expert 3	Summary
5. What performances and/ or products will reveal evidence of the previously mentioned skills empowerment?	1. See from activities. 2. Observe projects, products, and actions that reflect in the activities.	See progress at every step, way of thinking, and working with others.	1. Self-awareness – reflections; proactive/ essays 2. Systems thinking – able to share ideas; analyze and synthesize/ write protocols 3. Critical thinking – inquisitive; understands the pros and cons, and on dealing with the disadvantages through logical reasoning/ investigatory projects 4. Integrated problem-solving - sets up procedures and follows them; flexible in using verbal and non-verbal means to address concerns/ product selling, innovative products, or tools to address relevant concerns 5. Collaboration – able to work with others to complete a task/ any output that requires group cooperation	1. See from activities 2. Observe the progress of learning 3. Some products such as reflections, writing tasks, projects, products, or any output that link the skills' criteria

Questions	Expert 1	Expert 2	Expert 3	Summary
6. From the research of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand, please give any further recommendations for implementing these steps to meet the goals.	The first step should have a preliminary survey. To explore the issues, the preliminary survey can assist to identify problems or needs. The rest are fine.	The learning cycle is quite complete. It could be a connection between each step, especially reflection.	1. Ensure that modules are ready (complete with key concepts, samplers, rubrics) 2. Ensure that the language skills required in each step have been covered by their language teachers 3. identify learning skills in the context of business studies	1. Add preliminary research 2. More connection between each step especially reflection 3. Ensure the model readiness 4. Ensure the language learning elements 5. Add Business studies context

The data can be analyzed as follows.

1) The findings show that a variety of strategies can help to improve ESD skills. The majority of strategies should address active learning concepts that allow students to actively participate in the instruction. Participatory learning or cooperative learning, which teachers and peers can support, and project-based learning, which allows students to explore ideas and learn from real-world experiences, are two examples of strategies. Differentiation and independent study are used to make learning more meaningful to each student, and learning models such as graphic organizers, simulations, and roleplaying are used to scaffold students' learning. One important aspect is that the teacher's role in the classroom should be that of a role model. The teacher should emphasize the use of these strategies and empower students to learn in a long-term manner. Feedback and evaluation can also help students learn more effectively so that they can always reflect, plan, and monitor their actions.

2) According to the experts, good management can help students with self-directed learning and issue-based learning. To begin, the facilities should support students' learning by incorporating modern challenges such as the use of technology into instruction during the Covid-19 situation. Second, principles such as active learning or integrated learning should be followed. To encourage self-directed learning, the teacher can serve as a role model. In this way, the teacher can provide a framework for students to follow. Students should be able to gather feedback for self-improvement. The teacher should always encourage students to be self-assured when learning. Finally, a background study of the students can assist the teacher in more effectively planning instruction.

3) The conditions can be classified into three categories. To begin, an issue must be relevant to the students' context and capable of influencing them to think more deeply. It could be from real-life situations to keep them interested. Second, students should have at least basic language function skills or an intermediate level of English

proficiency to express their thoughts and ideas effectively. Students should be more productive and motivated to learn as they can always share and exchange ideas. The third requirement is to provide learning support as well as a conducive learning environment. A teacher must have an open attitude to create a good learning environment in which students feel comfortable sharing and participating. For students' self-directed learning, the teacher may provide samplers, checkpoints, and rubrics. The School can also provide some assistance in the form of a budget, technology, and other learning resources for both teachers and students to facilitate learning management.

4) The experts suggested that the level of each skill for ESD can be at a high level for the best outcome. However, the level can be moderate or low, as long as the students can use the scored level as feedback to improve themselves. Self-awareness skills should be prioritized first. It should be high level as it can assist the other skills more effectively. The literacy skills can also be addressed to allow students to express these skills for ESD strongly. The most important is that the level of the skills should meet the needs of the learners and be appropriate in their context and roles in society.

5) Students' activities demonstrate evidence of ESD achievement skills. A teacher may observe both the actions and the results of students while they are performing. Students may continually demonstrate their learning progress, so reflections may help the teacher understand the ongoing process of how each skill is developed. Various actions that reflect the skills may be observed. For this process, a good evaluation system is recommended.

6) The six designed steps of the EDIIIS model are in good condition but can add some details in some steps. In the first step, there should be a preliminary survey to support the issue exploration to meet the needs better. Reflection can be done through every step in the six processes to monitor students in learning. The model can add more business context to create a unique point. A teacher can also add guide questions in each step to promote self-directed learning during the challenges of the current

pandemic situation. Thus, the model can be flexible and not time-bound to address the goals of self-directed learning the best.

2. The finding and analysis of the EDIIIS model development.

In this research, the researcher uses the analyzed data from the previous part, document research, and human resources to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand (EDIIIS model).

It shows that the model consists of five parts which are principle, objective, EDIIIS processes, measurement and evaluation, and conditions which can be shown as follows.

2.1. The findings of the principle

The researcher synthesized the study results of research backgrounds, as well as the fundamental concepts of the EDIIIS instructional model development. Concepts from instructional models, constructivist learning theory emphasizing self-directed learning and issue-based learning, and concepts from Education for Sustainable Development are studied.

2.2. The findings of the objectives, EDIIIS processes, and Measurement and Evaluation

In these parts, they follow the ideas of the previous concepts where the researcher has researched the fundamental concepts and relevant studies. The objective is the focus of this research. That is to empower skills for education for Sustainable Development (ESD). The researcher has synthesized the learning steps of each model and found some coherence to create new six learning steps to promote ESD which is the EDIIIS process. The EDIIIS processes consist of the following.

1) Explore the issues

A teacher teaches the fundamental concepts of the learning subject to assist students to explore the issues. Students should brainstorm and prioritize the issues to find what issue is more important to them as a part of a community.

2) Diagnose the learning needs

The teacher motivates students to diagnose the learning need. The need should relevant and important for the learner and realistic within their social context. It should highlight the gap between the learner's current stage and the goal he/she wants to achieve which can be a personal desire or skill development.

3) Identify the learning objectives

Students specify the objectives of the outcomes. The objectives should be the final outputs of what lastly will be achieved without specifying the methods of learning. The teacher should empower and motivate students to set goals in learning which enhances the self-motivation of students.

4) Identify the learning tasks and plans

Students identify the learning task and strategies for each objective. How they propose to accomplish each of them. Students should identify the pieces of evidence, which could be both material objects and human resources that need to be collected to indicate the degree to which students achieved each objective. The verification needs to be provided to specify the specific method of evidence usage in judging each criterion. The learner specifies from the type of objectives that what criteria will vary. Then, students plan on what learning strategies or tools will work best to meet the objectives. They should specify learning resources, evidence of accomplishment, and how the evidence will be validated. Teachers and students can collaboratively design the planning process.

5) Implement the plan and monitor the process

Students execute the plan and monitor their learning. They could ask peers or teachers or seek for experts to consult and give feedback on their learning. This can be done before, during, and after implementing the plan. While monitoring their learning, if the first idea does not work out, students should manage the stress and conflict and not hesitate to adapt to the learning plan.

6) Summarize and evaluate the results

Students summarize the solution and evaluate the outcomes in the productivity and learning process. In this stage, students should understand how they learn and what learning process affects their learning ability in particular ways. Students evaluate their learning both for meeting learning goals and their learning processes. Furthermore, students should be able to suggest, recommend, or plan for future usage. The findings of the conditions

Next, the measurement and evaluation are the expected outcomes of the learners that the researcher has synthesized to be five skills.

1. Self-awareness refers to the ability to reflect perceived experiences within a multidimensional phenomenon while also being aware of personality traits, goals, emotions, attitudes, preferences, intentions, and so on to move to action in the future. The self-awareness in ESD addresses reflecting on one's role in a community that shares the values and principles that underpin sustainable development and society to set visions and plans for the future. It must meet the following requirements.

   1.1. The ability to be aware of one's need by reflecting on his/her role in society

   1.2. The ability to create a clear and valuable vision, and plan for the future

   1.3. The ability to move from awareness to knowledge to action.

1.4. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes

2. Systems thinking refers to the ability to see the big picture of a whole system in complex relationships and comprehend its dynamic interactions and feedback loops, which are characteristics of complex adaptive systems. Systems thinking in ESD addresses how a person recognizes, links, and synergizes embedded relationships while solving problems to synthesize various concepts. It must meet the following requirements.

   2.1. The ability to recognize and understand relationships in a whole picture

   2.2. The ability to analyze and synthesize embedded relationships among them

3. Critical Thinking refers to the ability to think logically and cognitively by gathering sufficient knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. To meet the following criteria, critical thinking in ESD should address the value issues, dilemmas, and challenges of sustainable development.

   3.1. The ability to question current norms, practices, opinions, and beliefs

   3.2. The ability to recognize the assumptions underlying our understanding, views, and opinions

   3.3. The ability to reflect on one's values, perceptions, and actions

4. Integrated problem-solving refers to the ability to use one's knowledge and experiences to solve a problem using a variety of methods. Integrated problem-solving in ESD addresses how a person can apply various skills and innovative solutions to model the learning process and solve the problems and challenges of sustainable development. It must meet the following requirements.

   4.1. The ability to apply different problem-solving frameworks to complex problems

   4.2. The ability to develop and implement innovative solution options

4.3. The ability to use various processes in learning

5. Collaboration refers to the ability to collaborate as a cross-sector partnership to generate shared values to cooperate with social responsibility. Collaboration in ESD refers to the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting. It must meet the following requirements.

5.1. The ability to participate in the group decisions

5.2. The ability to learn from others

5.3. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts

2.3. The findings of the conditions

After the researcher has studied the fundamental concepts, principles, and learning process, including surveyed and interviewing students, teachers, and experts, there are three conditions to be considered.

1) The issues must be relevant to students' context and can influence the students to think more.

2) Students should have at least basic language function skills or an intermediate level of English proficiency.

The findings of the Principles, Objectives, EDIIIS processes, Measurement and Evaluation, and Conditions are present in *Figure 1*6.

After reassessing and modifying the model and the model manuals from the experts' recommendations, the final draft of the model can be shown in *Figure 17.*

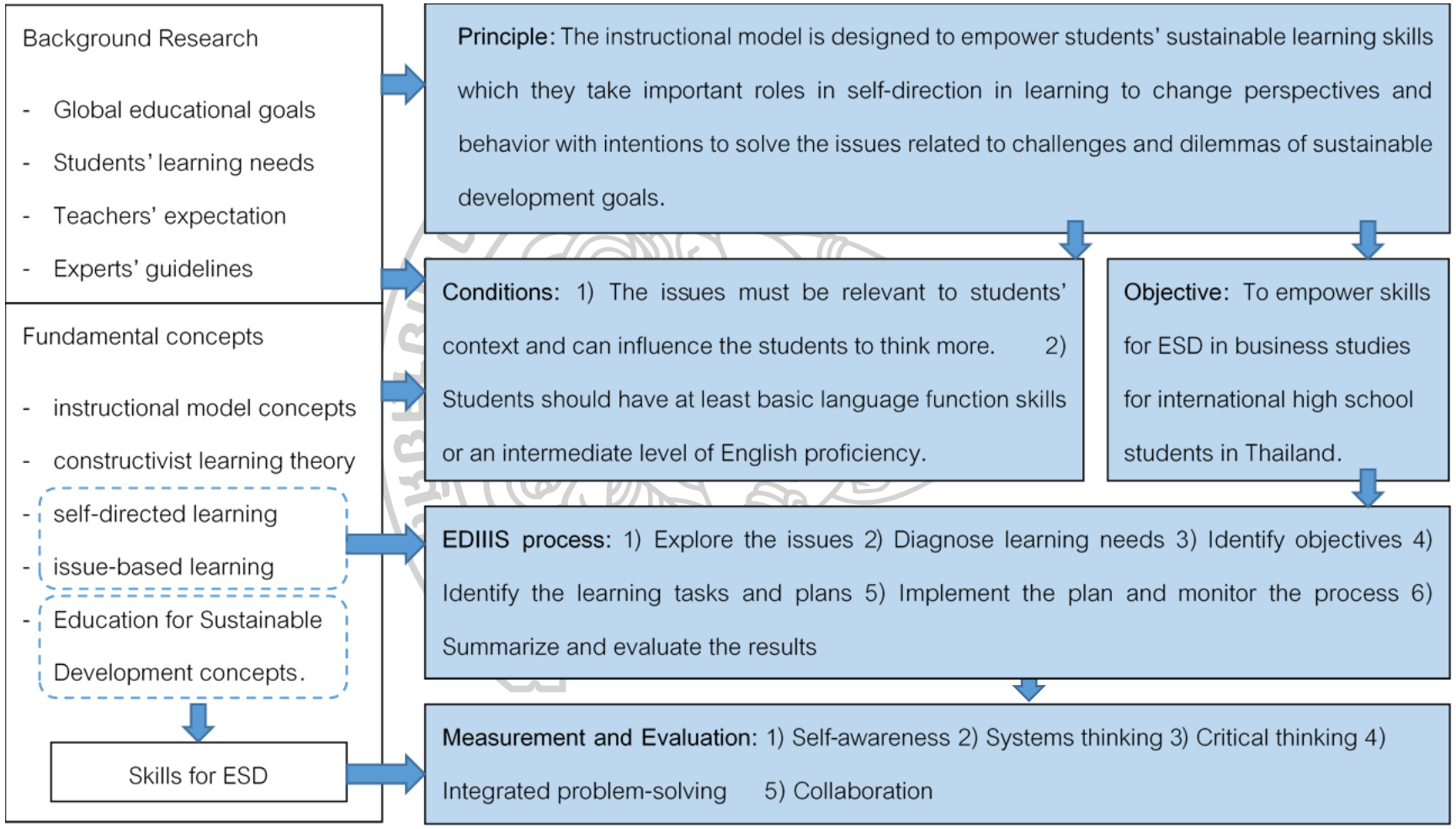


Figure 16 The findings of the Principles, Objectives, EDIIIS processes, Measurement and Evaluation, and Conditions

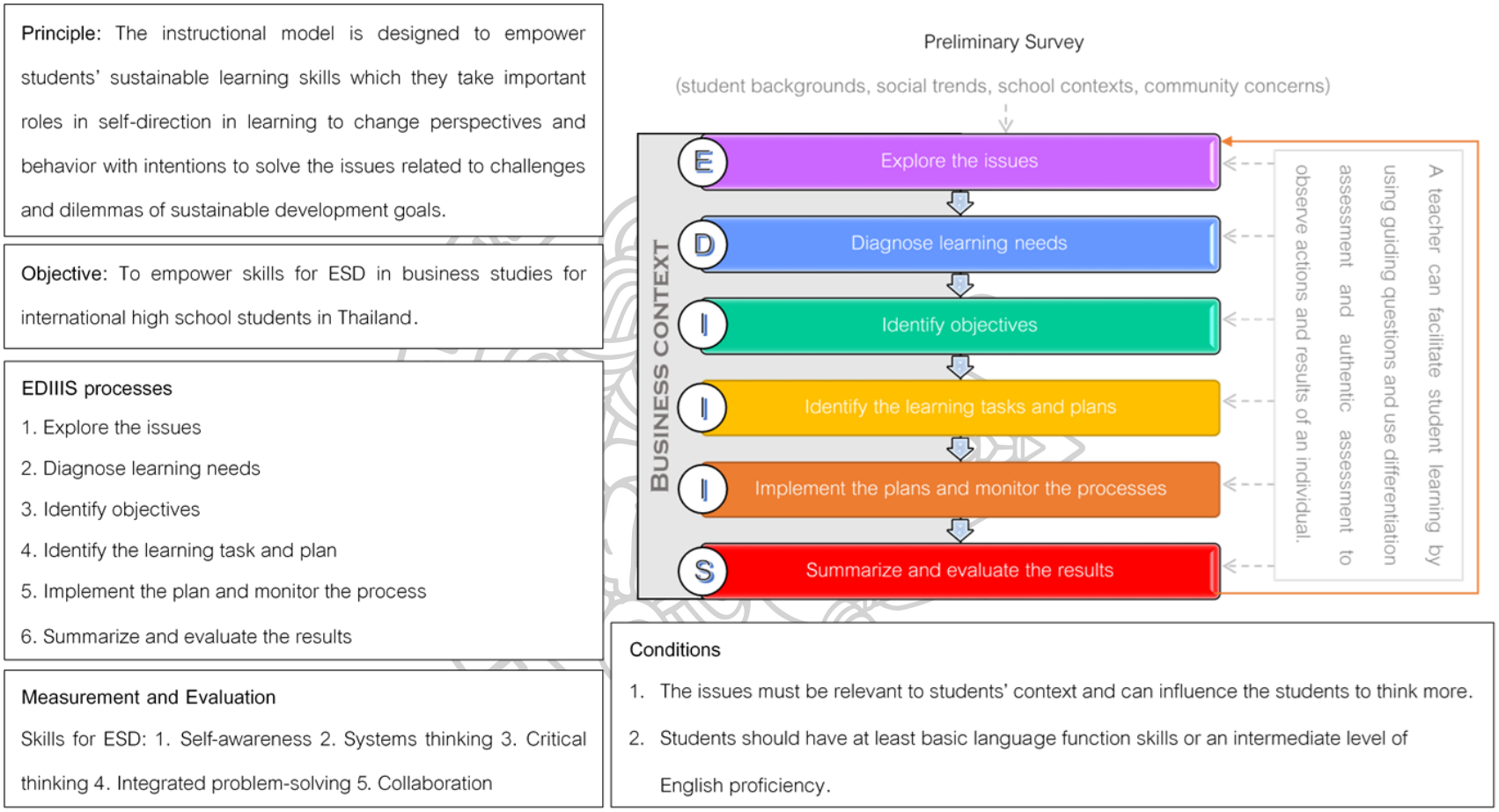


Figure 17 The constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies (EDIIIS Model)

Principles

The instructional model is designed to empower students' sustainable learning skills which they take important roles in self-direction in learning to change perspectives and behavior with intentions to solve the issues related to challenges and dilemmas of sustainable development goals.

Objectives

To empower skills for ESD in business studies for international high school students in Thailand

EDIIIS Processes

It consists of 6 steps as follows.

1. Explore the issues
   - A teacher guides the students to understand the fundamental concepts of the subject content to assist students to explore the issues. The teacher facilitates the learning by using guiding questions or providing learning materials such as case studies, sample projects, news, or websites to enable students to explore the issues.
   - Students apply the various process in learning to explore the issues such as researching, inquiring, choosing, brainstorming, and prioritizing the issues to find what issue is more interesting and more relevant to them and society including meeting the sustainable development goals.
2. Diagnose the learning needs
   - The teacher encourages students to diagnose their learning needs to solve problems. The teacher can introduce some assessment tools to help students diagnose learning gaps, such as SWOT analysis, SMART goals, and WOOP.

- Students actively diagnose their learning needs from their intrinsic motivation and involvement in society. The students must be honest to assess themselves to understand and diagnose gaps in learning effectively. Thus, the needs are relevant and important for the learner, and realistic within their social context. It should highlight the gap between the learner's current stage and the goal he/she wants to achieve which can be a personal desire or skill development.

3. Identify the learning objectives
   - The teacher motivates students to identify the learning objectives that are specific to their needs.
   - Students define the goals of the outcomes. Without specifying the methods of learning, the objectives should be the final outputs of what will be achieved. The teacher should empower and motivate students to set learning goals, which increases students' self-motivation.
4. Identify the learning task and plan
   - The teacher motivates students to identify the learning task and plan by guiding the students to begin the planning process. The teacher can use guiding questions to assist students to create plans that are appropriate to the student's learning styles. The teacher and the students can collaboratively design the planning process.
   - Students determine the learning task and strategies for each goal. The students devise strategies for achieving each of them. Students should identify the pieces of evidence, which could include both material objects and human resources, that must be gathered to indicate the degree to which each objective was met. The verification must specify the specific method of evidence used in judging each criterion. The learner specifies which criteria will vary based on the type of objectives. Then, students plan which learning strategies or tools will be most

effective in meeting the objectives. They should include information on learning resources, evidence of accomplishment, and how the evidence will be validated.

5. Implement the plan and monitor the process
   - The teacher assists students in their implementation process by providing advice and feedback. If necessary.
   - Students are entirely responsible for carrying out the plan and monitoring their progress. They could consult with peers or teachers, or they could seek expert advice and feedback on their learning. This can be done before, during, and after putting the plan into action. If the first idea does not work out, students should manage their stress and conflict while monitoring their learning and should not be afraid to adapt to the learning plan.
6. Summarize and evaluate the results
   - The teacher assists students in summarizing and evaluating the outcomes of their actions. The teacher may employ a variety of assessment tools to allow students to assess their performance. The evaluation should place a greater emphasis on formative assessment than summative assessment.
   - Students summarize and evaluate the outcomes in the productivity and learning process. The students should understand how they learn and what learning process affects their learning ability in particular ways. Students evaluate their learning both for meeting learning goals and their learning processes. Furthermore, students should be able to suggest, recommend, or plan for future usage.

Because the EDIIIS model is designed for business studies students, a teacher can emphasize the use of business context when implementing the model. A preliminary survey allows the teacher to understand student backgrounds, social trends, school

contexts, or community concerns, allowing for effective lesson planning to meet the student's and the community's needs. Furthermore, the teacher can use guiding questions as well as good assessment systems like checklists, worksheets, or rubrics to help students better monitor their learning. The teacher can also observe actions and outcomes during self-directed learning to assist student learning, such as providing useful feedback or supporting them so they are confident in their ability to improve themselves.

Measurement and Evaluation

There are 5 skills for ESD as follows.

1. Self-awareness refers to the ability to reflect perceived experiences within a multidimensional phenomenon while also being aware of personality traits, goals, emotions, attitudes, preferences, intentions, and so on to move to action in the future. The self-awareness in ESD addresses reflecting on one's role in a community that shares the values and principles that underpin sustainable development and society to set visions and plans for the future. It must meet the following requirements.
    1) The ability to be aware of one's need by reflecting on his/her role in society
    2) The ability to create a clear and valuable vision, and plan for the future
    3) The ability to move from awareness to knowledge to action.
    4) The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
2. Systems thinking refers to the ability to see the big picture of a whole system in complex relationships and comprehend its dynamic interactions and feedback loops, which are characteristics of complex adaptive systems. Systems thinking in ESD addresses how a person recognizes, links, and synergizes embedded

relationships while solving problems to synthesize various concepts. It must meet the following requirements.

1) The ability to recognize and understand relationships in a whole picture
2) The ability to analyze and synthesize embedded relationships among them

3. Critical Thinking refers to the ability to think logically and cognitively by gathering sufficient knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. To meet the following criteria, critical thinking in ESD should address the value issues, dilemmas, and challenges of sustainable development.
    1) The ability to question current norms, practices, opinions, and beliefs
    2) The ability to recognize the assumptions underlying our understanding, views, and opinions
    3) The ability to reflect on one's values, perceptions, and actions
4. Integrated problem-solving refers to the ability to use one's knowledge and experiences to solve a problem using a variety of methods. Integrated problem-solving in ESD addresses how a person can apply various skills and innovative solutions to model the learning process and solve the problems and challenges of sustainable development. It must meet the following requirements.
    1) The ability to apply different problem-solving frameworks to complex problems
    2) The ability to develop and implement innovative solution options
    3) The ability to use various processes in learning
5. Collaboration refers to the ability to collaborate as a cross-sector partnership to generate shared values to cooperate with social responsibility. Collaboration in ESD refers to the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to

effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting. It must meet the following requirements.

1) The ability to participate in the group decisions
2) The ability to learn from others
3) The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts

Conditions

3. The issues must be relevant to students' context and can influence the students to think more.
4. Students should have at least basic language function skills or an intermediate level of English proficiency.

2.3.1. The findings of the design and development of the model manual, unit plan, and the skills for ESD evaluation form to use with the model are found in Appendix B.

2.3.2. The findings of the content validity of the model, model manual, unit plan, and the skills for ESD evaluation form that were evaluated by seven experts present in chapter 3, STEP 2 Development (D1) , and Appendix A for details.

In summary, the first objective, "to study and develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand.", shows that the model consists of five parts which are principle, objective, EDIIIS processes, measurement and evaluation, and conditions. The principle is that the instructional model integrates self-directed learning and issue-based learning to empower skills for education for sustainable development (ESD) in Business studies, focusing on ESL learners in international high schools. The objective is to empower skills for ESD. The 5

ESD skills are 1. Self-awareness 2. Systems thinking 3. Critical thinking 4. Integrated problem-solving, and 5. Collaboration. The measurement and evaluation are to assess the 5 skills for ESD which are 1. Explore the issues 2. Diagnose learning needs 3. Identify objectives 4. Identify the learning tasks and plans 5. Implement the plan and monitor the process, and 6. Summarize and evaluate the results (EDIIIS processes). The conditions are 1. The issues must be relevant to students' context and can influence the students to think more 2. Students should have at least basic language function skills or an intermediate level of English proficiency. The model is evaluated quality by 7 experts to assess the content validity of the model and tools to use with the model which are the model manual, unit plan, and skills for ESD evaluation form.

Part 2: The findings of the effectiveness of the EDIIIS Model

The effectiveness of the model is found after the model implementation in the research step R2. The sample of the study was 24 students who are studying in the business elective "Skills for Leadership and Management". The study took 10 weeks in semester two of the school year 2021. The results from the model implementation are presented to meet the second research objective "2. To study the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills" which can be interpreted as follows.

Preliminary Survey Results

The preliminary survey from this study has done together with the initial process of step one of the model using the Employment Application Form. Nine students have studied business electives before in either grade 10 or 11. Another seven students claimed to have some experiences in business from self-studying, attending extra classes outside school, or owning their businesses. The other eight students never had business backgrounds before.

For the school context study, while the researcher implemented the model in the class, the school had just started the Hybrid Learning plan due to the situation of Covid-19. The format was to have students separate into two groups, attending in-person, rotating every five days. As consequence, there were seven students in group A, and nine students in group B, while eight students reported only staying online full time for the whole project long.

The effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills was collected from the Skills for ESD evaluation form by the teacher and students. The teacher used the form to observe the students' progress by each step of the model so that the evidence could be collected from various achievements during students' learning. The students use the evaluation form to evaluate their self-performance based on their reflections and actions.

The effectiveness of EDIIIS is at Relational level ($\bar{X}$= 4.18, S.D. = 0.44). The detail for the effectiveness of the instructional model to empower each skill are as follow: Self-awareness in ESD is at Relational level ($\bar{X}$= 4.10, S.D. = 0.45); Systems-thinking in ESD is at Relational level ($\bar{X}$= 4.06, S.D. = 0.69); Critical thinking in ESD is at Relational level ($\bar{X}$= 4.07, S.D. = 0.34); Integrated problem-solving in ESD is at extended abstract level ($\bar{X}$= 4.22, S.D. = 0.56); Collaboration in ESD is at extended abstract level ($\bar{X}$= 4.44, S.D. = 0.53). The data collected from each department is as Figure 18.

Moreover, the data collected from each student's self-evaluation presented in Table 29 revealed that the total average score level for the effectiveness of the instructional model to empower the skills for ESD of students varied from 2.77 – 4.88 which means the students had developed the skills from the multistructural to the extended abstract levels. Somehow, the effectiveness of EDIIIS for the average of the total 24 students is at the Relational level ($\bar{X}$= 4.18, S.D. = 0.44).

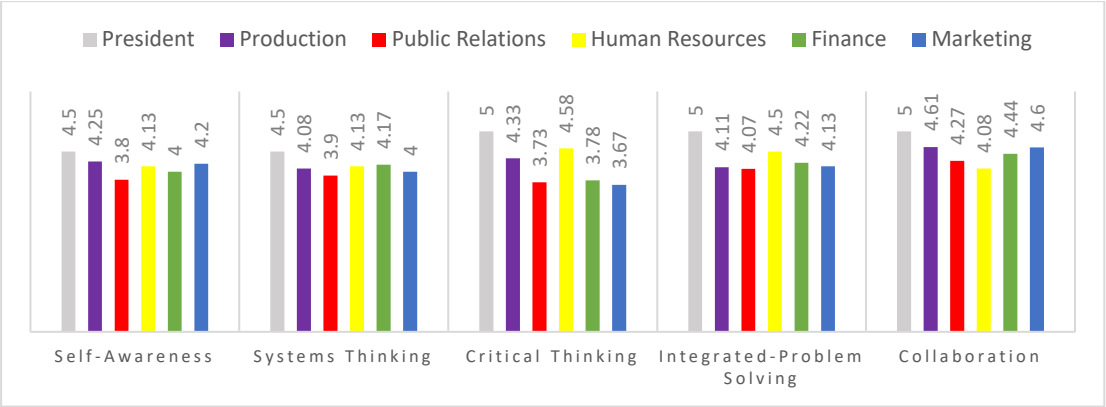


Figure 18 The effectiveness of the EDIIIS model to empower each skill in ESD is calculated from the average score from six departments.

Table 29 The summary highlights the data on the effectiveness of the EDIIIS to empower the skills for ESD.

Data	Results
Highest score level for overall skills	Department: Production ($\bar{X}$= 4.35) Individual: Vice President of production ($\bar{X}$= 2.77)
Lowest score level for overall skills	Department: Public Relations ($\bar{X}$= 3.95) Individual: Staff from Public Relations ($\bar{X}$= 2.77)
Highest score by each skill by department	Self-Awareness (SA) — Production ($\bar{X}$= 4.29) Systems Thinking (ST) — Finance ($\bar{X}$= 4.17) Critical Thinking (CT) — Human Resources ($\bar{X}$= 4.58) Integrated Problem-Solving (IPS) — Human Resources ($\bar{X}$= 4.50) Collaboration (CO) — Production ($\bar{X}$= 4.67)
The criteria which present the highest score	1. 4.c The ability to use various processes in learning ($\bar{X}$= 4.58) 2. 5.a The ability to participate in the group decisions ($\bar{X}$= 4.46) 3. 5.b The ability to learn from others ($\bar{X}$= 4.5)
The criteria which present the lowest scores	1. 4.b The ability to develop and implement innovative solution options ($\bar{X}$= 3.75) 2. 3.b The ability to recognize the assumptions underlying our understanding, views, and opinions ($\bar{X}$= 3.96) 3. 1.b The ability to create a clear and valuable vision, and plan for the future ($\bar{X}$= 4.00)

Table 30 The summary score level evaluated by students calculated for each criterion by departments

Leadership Class Section B	Self-Awareness					Systems Thinking			Critical Thinking				Integrated Problem-Solving				Collaboration				Total $\bar{X}$
	1a	1b	1c	1d	$\bar{X}$	2a	2b	$\bar{X}$	3a	3b	3c	$\bar{X}$	4a	4b	4c	$\bar{X}$	5a	5b	5c	$\bar{X}$	
President (1 member)	5	4	5	4	4.50	4	5	4.50	5	5	5	5.00	5	5	5	5.00	5	5	5	5.00	4.80
Production (5 member)	4.5	3.67	4.5	4.33	4.25	4.17	4	4.08	4.5	4	4.5	4.33	4.33	4.17	3.83	4.11	4.5	4.67	4.67	4.61	4.28
Public Relations (5 member)	3.6	4	3.6	4	3.80	4.2	3.6	3.90	3.8	3.6	3.8	3.73	4	3.6	4.6	4.07	4.2	4.2	4.4	4.27	3.95
Human Resources (4 member)	3.5	4.5	4.25	4.25	4.13	4	4.25	4.13	4.75	5	4	4.58	4.5	4	5	4.50	4	4.25	4	4.08	4.28
Finance (3 member)	3.67	4	4.33	4	4.00	4.33	4	4.17	3.67	3	4.67	3.78	5	2.67	5	4.22	5	4.33	4	4.44	4.12
Marketing (5 member)	4.4	4	4.4	4	4.20	3.8	4.2	4.00	3.6	3.8	3.6	3.67	4	3.6	4.8	4.13	4.6	4.8	4.4	4.60	4.12
$\bar{X}$	4.04	4	4.25	4.13	4.10	4.08	4.04	4.06	4.13	3.96	4.13	4.07	4.33	3.75	4.58	4.22	4.46	4.5	4.38	4.44	4.18
S.D.	0.49	0.70	0.73	0.70	0.45	0.64	0.83	0.69	0.49	0.64	0.49	0.34	0.73	0.45	1.07	0.56	0.73	0.45	0.45	0.53	0.44

The effectiveness of each skill was collected and interpreted as follows.

1. **The effectiveness of the instructional model to empower self-awareness in ESD and the level of skill**

The effectiveness of the model to empower self-awareness in ESD is at the Relational level ($\bar{X}$= 4.10, S.D. = 0.45). Each criterion has an average score that varies from 4.00 to 4.25 levels, and S.D. varies from 0.49 to 0.73. The students developed the highest ability to move from awareness to knowledge to action at the Extended abstract level. The students developed the least ability to create a clear and valuable vision, and plan for the future, but still at the Relational level.

The Production department has the highest average score ($\bar{X}$=4.25) for the self-awareness skill in ESD. The Public Relations department has the lowest average score ($\bar{X}$=3.60) for the self-awareness skill in ESD.

To observe students' weekly performances, the researcher found that during the first and the second stages of the EDIIIS process, the students seemed to have skills levels only Prestructural to Unistructural. The students mostly needed guidance from teachers. They could sometimes inform or identify their needs if they understand the assignments. The students, who have more information about things they are working on or need to make a decision, are found to have higher self-awareness skills. Since the students have worked on business planning in the third step of learning, their skills have been found to improve significantly. Only a few cases were found where students needed help from the teacher or peers when they encountered a problem that they do not have the knowledge to solve.

The summarized data is presented as follows.

Table 31 The summary of the effectiveness of the instructional model to empower self-awareness in ESD by students' evaluation

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
1.a	The ability to be aware of one's need by reflecting on his/her role in society	4.04	0.49	Rational	Ten students know what they want and could be aware of others' wants then, extend the ideas to what do they need to do. One-third of the students know their roles while they were working within the team, with the other teams, and with customers. Five students can do something when assigned clearly but are not sure if that is relevant to their personal needs. One student only work on the tasks that were directed.
1.b	The ability to create a clear and valuable vision, and plan for the future	4.00	0.70	Rational	Half of the class can create clear vision and plans. The team leaders can create a clear vision and plans for both themselves and their teams. The students can generally design clear plans for each situation based on their roles. Some of them use certain tools to record and monitor the plans. Six students always use feedback from the others to cooperate on the plans. Four students sometimes need confirmation from the team leaders first. Only one student has a goal but an unclear plan.

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
1.c	The ability to move from awareness to knowledge to action.	4.25	0.73	Extended Abstract	Half of the students have a strong commitment to follow their plans by always asking or searching for information from others even when they are not working in class. One-third of the students can generally perform the tasks they planned confidently with support from their teams. A few students sometimes need to keep up the work with the others while working on individual works or some may need support from others as they have fewer backgrounds and experiences to continue the work confidently.
1.d.	The ability to evaluate and assess the consequences of actions to deal with conflicts and changes	4.13	0.70	Rational	Nine students can evaluate their situations and plan to deal with the conflicts sharply by also being aware of the impacts on others. Ten students can review the consequences of their actions to improve or avoid performing some things. Four students changed some actions to deal with conflicts without knowing the effects of the actions. One student only relied on the team leader.
	Total Average Level	4.10	0.45	Rational	

Table 32 The summary of the effectiveness of the instructional model to empower self-awareness in ESD by teacher's weekly observation

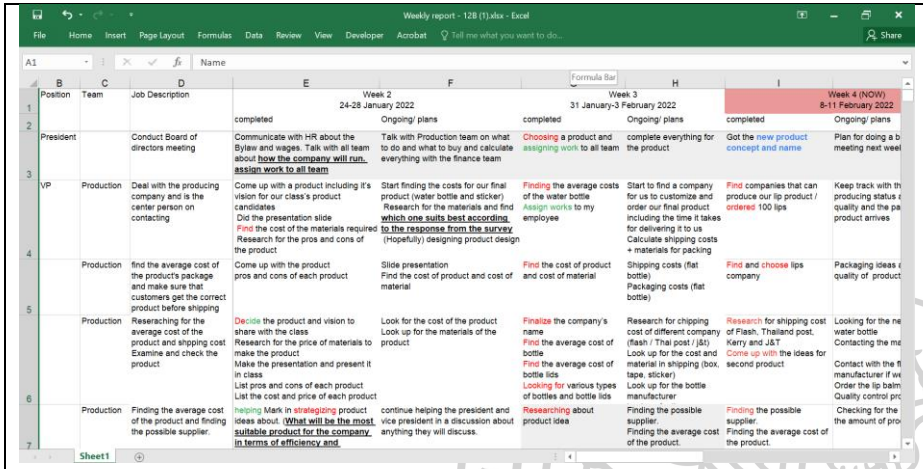
Week	EDIIIS Process	1.a. The ability to be aware of one's need by reflecting on his/her role in society	1.b. The ability to create a clear and valuable vision, and plan for the future	1.c. The ability to move from awareness to knowledge to action.	1.d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
1	Stage 1 Explore the issues	Every student except one can inform what they want. Five of them need more time and a guide from the teacher to explore and identify their needs. Twelve students can reflect on their needs to be relevant to themselves but not to community awareness. Two students cannot explain how their needs reflect their roles in society. One student cannot inform his need	Students need to discuss the vision together as a whole team. Only 13 students can brainstorm some ideas to create a vision but the ideas have not been clear and finalized yet. The plan has not been designed clearly by most students. Only a few students can start the plans at their own pace.	N/A	N/A

Week	EDIIIS Process	1.a. The ability to be aware of one's need by reflecting on his/her role in society	1.b. The ability to create a clear and valuable vision, and plan for the future	1.c. The ability to move from awareness to knowledge to action.	1.d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
2	Stage 2 Diagnose the learning needs	Nineteen students can explain their needs by reflecting on their roles. Five students need prompt or direction from others. Students from human resources and finance departments can explain their needs to others to encourage others to vote for the company's bylaws.	Most students can create individual work goals and plans. The leader students can create goals and detailed plans but with some guidance from the teacher. Only three students cannot create clear plans. Some students' plans require more data.	Most students can inform what they have completed to meet their goals. Some students with clear responsibilities can work effectively at their own pace even when they are not at school. Only two students could not process their works yet as they just understood their roles. They need more guidance than the others.	Most students need a guide from the teacher to evaluate their decision. Only a few students can identify some concerns about the ideas. The rest seemed to only rely on their friends' opinions to avoid any conflicts.

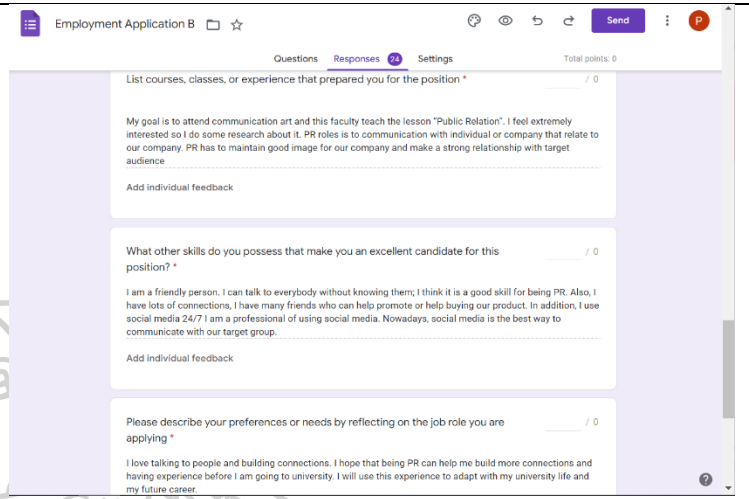
Week	EDIIIS Process	1.a. The ability to be aware of one's need by reflecting on his/her role in society	1.b. The ability to create a clear and valuable vision, and plan for the future	1.c. The ability to move from awareness to knowledge to action.	1.d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
3 - 4	Stage 3 Identify the learning objectives	Some students in the production team, finance team, and marketing team can discuss various aspects of ideas to evaluate their current needs and extend the idea to the other teams' members	The students can identify learning goals. The leaders can identify goals clearly and share them with the members. Only a few students cannot create plans and need some guidance from teachers or peers.	The students normally work when they are not at school. They show high responsibility to work when they have clear roles to follow.	The students can identify their decisions after collecting enough information. Some can discuss the problem about to continue the same idea for the product.

Week	EDIIIS Process	1.a. The ability to be aware of one's need by reflecting on his/her role in society	1.b. The ability to create a clear and valuable vision, and plan for the future	1.c. The ability to move from awareness to knowledge to action.	1.d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
5	Stage 4 Identify the learning task and plan	Every student can vote to approve or disapprove of their plans reflecting their needs on their roles in the company. The students were aware of their needs to continue or discontinue the plans even if it created some conflict with the others.	The students can create a clear and valuable company vision and business plans consisting clear framework for implementation in the following weeks.	The students could write the job description and work to complete their assignments. Only students from the president role, the finance team, and the marketing teams required more time to work due to some changes in the plans	The students can evaluate the plans and explain how the plans should be changed or implemented to deal with conflicts.
6-9	Stage 5 Implement the plan and monitor the process	The students can evaluate their needs by being more aware of the community. They voted to continue reproduction once they analyzed competitors, trends, and customers' feedback.	The students had a strong vision to expand the business so they decided to reproduce before the first stocks sold out. The plans are more clear with supporting ideas from previous outcomes.	The students can work to implement the plan at their own pace without the teacher's guidance. The teacher only needs to give small feedback for a better quality of work.	The students can evaluate their performance and be able to change their plans as the results from the previous implementation showed a good opportunity to continue the business only with some product choices.

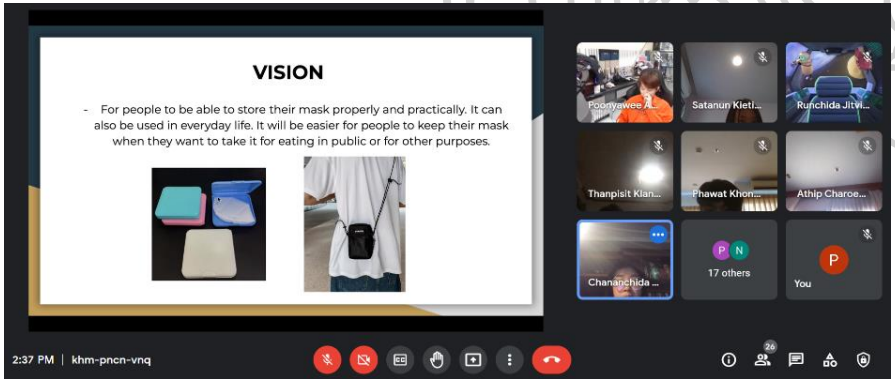
Week	EDIIIS Process	1.a. The ability to be aware of one's need by reflecting on his/her role in society	1.b. The ability to create a clear and valuable vision, and plan for the future	1.c. The ability to move from awareness to knowledge to action.	1.d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes
10	Stage 6 Summarize and evaluate the results	The students were able to evaluate their business's performance and reflect on various aspects of business contexts. All students can reflect their ability, achievements, and performances based on their roles in business with adequate supportive details.	Each team can discuss and design improvement plans for the future business and present them in the final business presentation.	N/A	All students evaluate their past actions to deal with conflicts and explain if their performances were satisfactory or unsatisfied at what level.



Each student wrote an individual goal and action plan weekly.



The students evaluated their needs to apply for a job position.



The students had a meeting to decide on a vision and product idea.

Students worked during the hybrid learning.

Figure 19 Examples of students' performance for self-awareness in ESD

2. **The effectiveness of the instructional model to empower systems-thinking in ESD and the level of skill**

The effectiveness of the model to empower systems thinking in ESD is at the Relational level ($\bar{X}$= 4.06, S.D. = 0.69). Each criterion has an average score that varies from 4.04 to 4.08 levels, and S.D. varies from 0.64 to 0.83. The students developed the highest ability to recognize and understand relationships in a whole picture. The students developed the least ability to analyze and synthesize embedded relationships among them.

The Finance department has the highest average score ($\bar{X}$=4.17) for the systems thinking skills in ESD. The Public Relations department has the lowest average score ($\bar{X}$=3.19) for the systems thinking skills in ESD.

To observe students' weekly performances, the researcher found that most students firstly develop the whole picture concepts with simple ideas focusing on their roles and their departments. Later, when they are creating a business plan, more students can recognize and understand the relationships of their teams and the others better as they are required to work coordinately. Some students found to understand the relationship once everything is formulated as they are not the key person to coordinate with the other teams. During the implementation process of the EDIIIS model, the students were allowed to work with other stakeholders including stockholders and customers which enable them to analyze clear relationships more.

The summarized data is presented as follows.

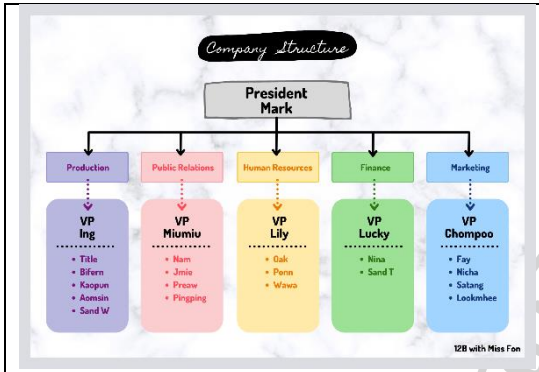
Table 33 The summary of the effectiveness of the instructional model to empower systems thinking in ESD by students

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
2.a	The ability to recognize and understand relationships in a whole picture	4.08	0.64	Rational	Half of the students can recognize, understand and explain relationships both within and outside their teams (the work sequences) clearly. Almost one-third can also explain the impact of any actions on the whole picture while they were working. Somehow, five students can see the picture once all the processes have been completed. Some students still got quite incorrect or too narrow ideas including only seeing relationships within their teams.
2.b	The ability to analyze and synthesize embedded relationships among them	4.04	0.83	Rational	Almost half of the students comfortably shared and discussed ideas within their teams. One-third of the students can further analyze and synthesize embedded relationships among the team members and others in society to create a clear picture of what to do. However, a quarter of students only shared and discussed ideas within their teams or only with the team leaders.
	Total Average Level	4.06	0.69	Rational	

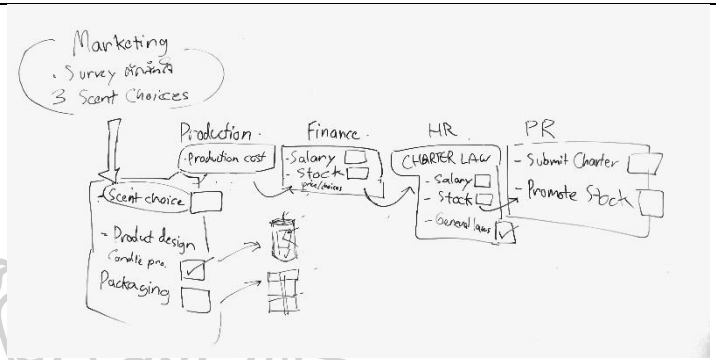
Table 34 The summary of the effectiveness of the instructional model to empower systems thinking in ESD by teacher's weekly observation

Week	EDIIIS Process	2.a. The ability to recognize and understand relationships in a whole picture	2.b. The ability to analyze and synthesize embedded relationships among them
1	Stage 1 Explore the issues	The students can recognize the business structure but did not understand the relationships of each department. The teacher needed to provide clear instructions and guidance to assist students to see the connection of how each department in the business work together.	N/A
2	Stage 2 Diagnose the learning needs	The students in the same team can recognize the roles in the business but cannot design how each member should work together as a whole team clearly. The roles for each member could not be presented clearly and just followed the guidelines from the teacher's instruction.	It could not be observed clearly. The students could draw an organizational chart of the company but it did not present how they analyzed and synthesized the embedded relationships of each position.
3 - 4	Stage 3 Identify the learning objectives	Many students can understand the relationships of each team as a whole picture, especially the leader groups. They can identify who or what team they need to contact if they need the work done. They can also explain how each team should work coordinately to complete the assignments in terms of the work connections they have together.	The students seemed to be able to analyze the relationship among the team members and made decisions to work with certain members to achieve their goals. Some staff students stated to discuss and plan together without following the hierarchical steps that it must be approved by the team leaders first. Some team leaders had discussed and finalized plans without the president's awareness.

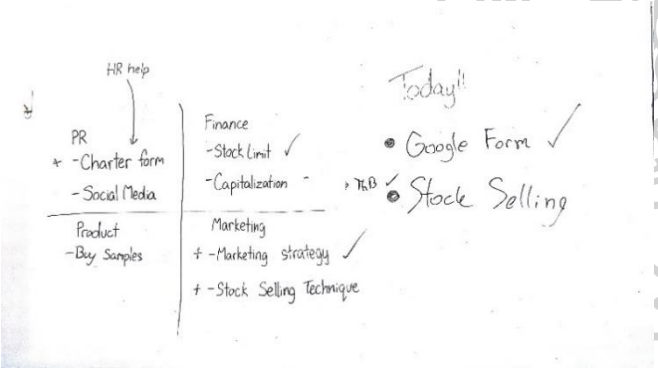
Week	EDIIIS Process	2.a. The ability to recognize and understand relationships in a whole picture	2.b. The ability to analyze and synthesize embedded relationships among them
5	Stage 4 Identify the learning task and plan	The students can recognize and understand relationships in the business of how each team's plan can be connected in cohesion. They can inform whether any part of the plans should be changed as it did not consistence with the other teams' plans.	The students can analyze the connection of each department's business plan to synthesize and create a single plan for the company which presents a clearer vision and mission for implementation.
6-9	Stage 5 Implement the plan and monitor the process	The students understand the relationship not only within their teams but also with the others outside their business.	The students can analyze and synthesize the ideas from stakeholders who are customers and employees to design more effective operational systems for the business.
10	Stage 6 Summarize and evaluate the results	The students can show a good understanding of the contribution of each team to the business. They can tell which part of the team has what responsibility. They also understand how their roles are important to the company.	The students can analyze the relationship of each team to assign different parts of the final report to be integrated later. The students can also show a clear hierarchical structure to explain how the work is done from each part of the company accomplished in each step from the start to finish.



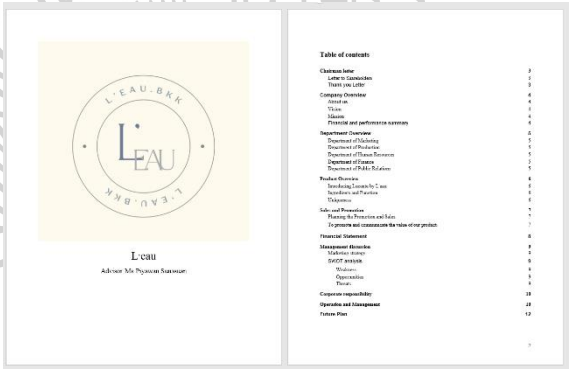
The students created a company structure.



The students analyzed and synthesized ideas from each department's progress to create a working plan systematically.



The students drew a diagram to understand the whole picture of the business's process.



The students created a final report to summarize the whole business's ideas and performance.

Figure 20 Examples of students' performance for systems thinking in ESD

3. **The effectiveness of the instructional model to empower critical thinking in ESD and the level of skill**

The effectiveness of the model to empower critical thinking in ESD is at the Relational level ($\bar{X}$= 4.07, S.D. = 0.34). Each criterion has an average score that varies from 3.96 to 4.13 levels, and S.D. varies from 0.49 to 0.64. The students developed the highest ability to question current norms, practices, opinions, and beliefs as well as the ability to reflect on one's values, perceptions, and actions. The students developed the least ability to recognize the assumptions underlying our understanding, views, and opinions.

The Human Resources department has the highest average score ($\bar{X}$=4.58) for critical thinking skills in ESD. The Marketing department has the lowest average score ($\bar{X}$=3.67) for critical thinking skills in ESD.

To observe students' weekly performances, the researcher found that most students cannot question things at first when they have less experience and knowledge about them. They also struggled to find assumptions unless guided by the teacher. However, when the students collected more information, they were more confident to question and start discussions with others to find solve any issues. By around week 3-4 when the students identified their learning objectives and planned their business, they questioned many things as they noticed the assumptions may go wrong. They also developed to reflect on others' ideas and perceptions while working together to develop the business plans.

The summarized data is presented as follows.

Table 35 The summary of the effectiveness of the instructional model to empower critical thinking in ESD by students

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
3.a	The ability to question current norms, practices, opinions, and beliefs	4.13	0.49	Rational	Three-fourths of the students can question any issues that may cause a problem. They can initiate to ask and discuss immediately to solve the issue. More than half of them raised the question that created the other following issue to be questioned and solved. Five students had only simple questions or may not initiate the question but can discuss it. Only one student could not see any issue unless it's been raised by others.
3.b	The ability to recognize the assumptions underlying our understanding, views, and opinions	3.96	0.64	Rational	Seven students understood the issue from various viewpoints and ideas to use with the business. They can further plan and predict the outcomes. Ten students can see assumptions from various views and opinions and even sometimes disagree with them. However, they can imagine seeing a good result in the end. A quarter can think about some assumptions but may be a bit confusing about how things will be done to meet the outcomes. One student can see the assumptions but not correctly.

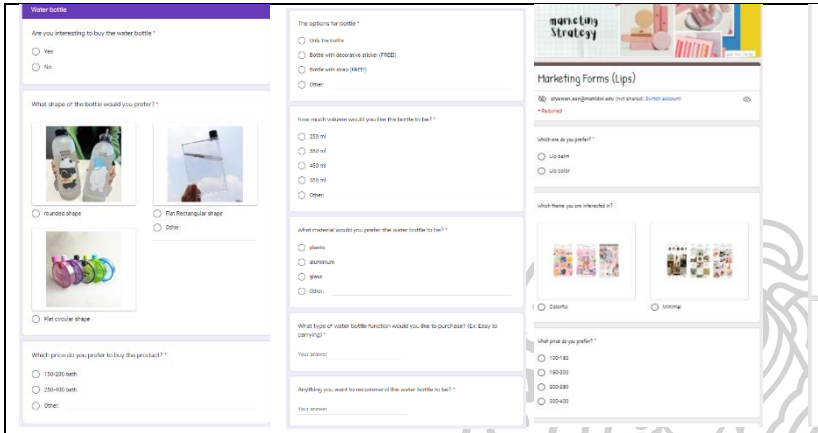
No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
3.c	The ability to reflect on one's values, perceptions, and actions	4.13	0.49	Rational	Seven students can consider all voices from the teams and apply the ideas to make good decisions and create effective business plans. Thirteen students understood the others' professionals according to their roles as well as their roles. Four students only perceived an idea as a group or grasped an easy concept.
	Total Average Level	4.07	0.34	Rational	

Table 36 The summary of the effectiveness of the instructional model to empower critical thinking in ESD by teacher's weekly observation

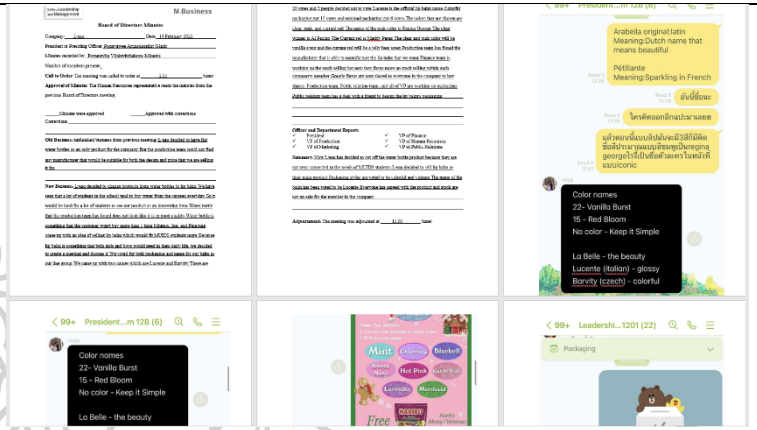
Week	EDIIIS Process	3.a. The ability to question current norms, practices, opinions, and beliefs	3.b. The ability to recognize the assumptions underlying our understanding, views, and opinions	3.c. The ability to reflect on one's values, perceptions, and actions
1	Stage 1 Explore the issues	The students cannot create questions clearly to reflect critical thinking. The questions are mostly for helping them to understand the fundamental concepts. Only one student can label a question about current business trends in school but only to point out an idea he is interested in doing.	The students struggled to find assumptions for building the company's values, vision, and missions. They were firstly unsure how the concepts are different. However, they seemed to recognize and understand the concepts better when the teacher gave 5-6 examples from existing ideas students are familiar with.	Thirteen students tried to identify the company's brand value idea to reflect their values but cannot discuss or explain how the values should be established for the company. The rest could not be observed clearly for the ability.
2	Stage 2 Diagnose the learning needs	Most students discussed simple questions to help them understand the roles they applied and elected to work for. The teams' leaders could be seen to question more specific questions to help them divide the role of each member of a team.	The students tried to present their backgrounds, skills, and willingness to apply for the job position that they want. This showed how they can outline assumptions about themselves to link with the job role. However, a few students could not recognize the assumptions correctly showing that they did not understand the concept clearly.	The leader students could influence the others to vote for them. The rest of the class could elect a person to work for a position by reflecting on his/ her values, perceptions, and actions. Each team chose the task(s) for each member based on preference mostly.

Week	EDIIIS Process	3.a. The ability to question current norms, practices, opinions, and beliefs	3.b. The ability to recognize the assumptions underlying our understanding, views, and opinions	3.c. The ability to reflect on one's values, perceptions, and actions
3 - 4	Stage 3 Identify the learning objectives	The students from the marketing and public relations departments could create a survey with essential questions to help them design an effective marketing plan. The students from the human resources and finance department can discuss questions to help them create Bylaws and Capitalization plans. The President and production staff discussed some questions to find potential products.	The students could outline some assumptions for designing a Charter and Bylaws, Capitalization plans, based on their experiences. It needed some guides and examples from the teacher to start the discussion.	The students could complete their assignments by reflecting on their values and perceptions based on their departments' roles. They were also aware of the others' roles as well so they could design the most effective plans.
5	Stage 4 Identify the learning task and plan	Some students who had noticed some concerns and conflicts started to question the current decision. They raised a discussion with the company which later allow all members to evaluate and decide to change the previous plans.	The students created some assumptions from the conflicts to predict possible negative outcomes if they continue the current plans. Lastly, they could propose a decide the new plan and point out the assumption of possible positive outcomes based on the evidence they have.	Some students could explain and convince others to follow their new ideas by showing clear evidence of any concerns and conflicts with the existing plan. The other students could discuss and evaluate the ideas from various departments' sources to make the decision lastly.

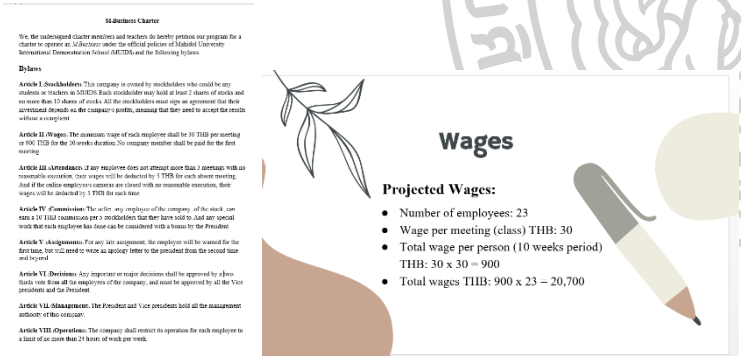
Week	EDIIIS Process	3.a. The ability to question current norms, practices, opinions, and beliefs	3.b. The ability to recognize the assumptions underlying our understanding, views, and opinions	3.c. The ability to reflect on one's values, perceptions, and actions
6-9	Stage 5 Implement the plan and monitor the process	The students can create surveys to diagnose any challenges and concerns among stakeholders who are customers and employees to design how they can improve their current actions to be more effective.	The student can see different outcomes as they collected more ideas from customers and employees. They can suggest alternative approaches to meet different outcomes.	The students can reflect on the values, perceptions, and actions of stakeholders as they evaluate the customers' feedback and employees' feedback to understand their performances.
10	Stage 6 Summarize and evaluate the results	The students questioned themselves to understand how can they present the ideas the best to reflect their performances, views, and outcomes.	The students can completely see the outcomes to meet the assumptions or not as they created the final presentation.	The students evaluated their performances and overall business performances which allowed them to reflect on their values, perceptions, and actions.



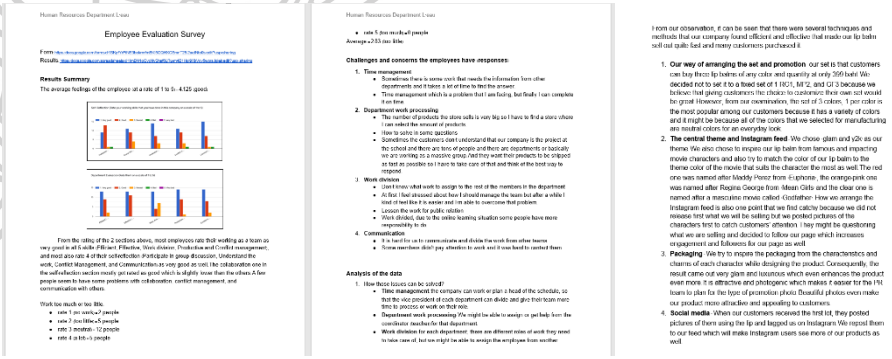
The students created a survey about product ideas to understand trends and customers' needs.



The meeting minutes show that the students questioned the current product ideas and conducted a meeting to discuss changing them.



The students created the company's Bylaws to outline the assumptions for the organizational plans.



The students evaluated feedback from customers and employees to reflect on their perceptions and actions and to suggest better plans for the future.

Figure 21 Examples of students' performance for critical thinking in ESD

4. **The effectiveness of the instructional model to empower integrated problem-solving in ESD and the level of skill**

The effectiveness of the model to empower integrated problem-solving in ESD is at the Extended Abstract level ($\bar{X}$= 4.22, S.D. = 0.56). Each criterion has an average score that varies from 3.75 to 4.58 levels, and S.D. varies from 0.45 to 1.07. The students developed the highest ability to use various processes in learning. The students developed the least ability to develop and implement innovative solution options.

The Human Resources department has the highest average score ($\bar{X}$=4.50) for integrated problem-solving skills in ESD. The Public Relations department has the lowest average score ($\bar{X}$=4.07) for integrated problem-solving skills in ESD.

To observe students' weekly performances, the researcher found that the teacher had to guide the students to solve some problems at first as they lacked the knowledge to start the business. They mostly used simple learning processes which were searching and inquiring about information to know the concepts and see some ideas to start their work. They developed some simple solution options to solve basic issues. However, when the students were more confident as they collected more data and ideas, they tried to solve problems by designing various frameworks to see different results and seek the best outcomes. They have developed more innovative ideas to help them achieve their goals. They also developed to use various learning processes, especially higher-order thinking skills to continue their work such as judging, imagining, connecting, and valuing ideas.

The summarized data is presented as follows.

Table 37 The summary of the effectiveness of the instructional model to empower integrated problem-solving in ESD by students

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
4.a	The ability to apply different problem-solving frameworks to complex problems	4.33	0.73	Extended Abstract	More than half of the students can evaluate various problem-solution frameworks to make the best decision to solve a problem. One-third can apply various frameworks when there was a problem. Two students can apply many solutions but may not be the most effective one. One student always shares some ideas but does not solve the problem.
4.b	The ability to develop and implement innovative solution options	3.75	0.45	Rational	More than half of the students can use many tools to discuss ideas for helping them decide to solve a problem. Only four students shared some ideas and incorporated others' ideas to solve a problem effectively. Four more students can use some tools to try to solve a problem. Three students tried to develop and implement a solution but not effectively as the idea is weak or lacked enough information to support the idea.

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
4.c	The ability to use various processes in learning	4.58	1.07	Extended Abstract	Three-quarters of the students can use various processes in learning to solve various issues that occurred as well as prevent any future issues. Three students can use many learning processes to solve a problem. The other three students used some learning processes to work but were not relevant to problem-solving.
	Average	4.22	0.56	Extended Abstract	

Table 38 The summary of the effectiveness of the instructional model to empower integrated problem-solving in ESD by teacher's weekly observation

Week	EDIIIS Process	4.a. The ability to apply different problem-solving frameworks to complex problems	4.b. The ability to develop and implement innovative solution options	4.c. The ability to use various processes in learning
1	Stage 1 Explore the issues	N/A	N/A	The students explored various themes of learning so they were only in the early process of knowing and inquiring about information.
2	Stage 2 Diagnose the learning needs	In this stage, the students did not have to solve any complex problems. However, some students had problems finishing some assignments due to lacking comprehension. They mostly relied on the teacher to guide them to solve problems.	The essential questions for the students this week were to inquire about information to start their business. They have not solved any complex problems yet. The problems mostly were how to start the business based on their roles. Thus, they only inquired from the teacher to guide them to solve problems.	The students could identify and select to apply for the job position that meets their preferences, backgrounds, or plans. Eight students could not work in the position they aimed for at first. One student had to work in a position she did not apply for. However, the students could modify their choices and make decisions to construct a final company structure lastly. Most abilities that could be observed were brainstorming, searching, and deciding. Some started to create documents that used only the knowing process.

Week	EDIIIS Process	4.a. The ability to apply different problem-solving frameworks to complex problems	4.b. The ability to develop and implement innovative solution options	4.c. The ability to use various processes in learning
3 - 4	Stage 3 Identify the learning objectives	The students tried to solve problems by themselves more, they discussed within their teams, asked peers to assist, and searched for more information on the internet to solve problems. However, some students who have not yet grasped the concepts still need guidelines from teachers. An example must be given to allow them to understand the concepts more. However, students could not solve problems effectively. There were many incomplete parts and unsolved ideas.	The students have developed and implemented some innovative solution options. Regardless of creating surveys and using forms to design plans that students had done, students also searched for example successful businesses to use as ideas and to convince others to change business plans. However, the solutions seemed to conflict with the previously established plans so they needed more revision.	The students used similar learning processes compared to the previous week. There were mostly about data gathering such as searching, finding, surveying, and asking for more information. All had to choose a product and a company name so they needed to discuss, judge, and choose to vote for their favorite ideas.

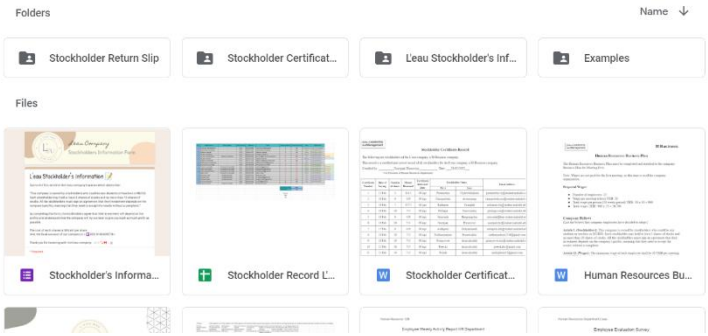
Week	EDIIIS Process	4.a. The ability to apply different problem-solving frameworks to complex problems	4.b. The ability to develop and implement innovative solution options	4.c. The ability to use various processes in learning
5	Stage 4 Identify the learning task and plan	The students found some conflicts to continue the existing plans. Thus, they have to come up with various frameworks to change their ideas including company name, product, and product name.	The students had developed a new business idea to solve the conflicts. The new solution shows better potential to solve the problems correctly and more effectively.	The students applied various learning processes similar to previous weeks. The processes were more complex to judge, value, and choose the ideas. In addition, they also connected many ideas and predicted the results in advance.

Week	EDIIIS Process	4.a. The ability to apply different problem-solving frameworks to complex problems	4.b. The ability to develop and implement innovative solution options	4.c. The ability to use various processes in learning
6-9	Stage 5 Implement the plan and monitor the process	The production and marketing team designed and applied three different frameworks to manage stock purchasing. Public relations designed at least three platforms to contact customers, and promote products. The finance and marketing team needed more time to solve some complex problems as they involve customers.	The students developed and implemented various innovative solutions. Each team followed their plans. The solutions were varied responding to real situations. For example, the students decided on a new stock planning responding to current sales record, modified some services based on customers' feedback, use association promotion to attract more sales, and use several channels for order confirmation. The students also suggest a plan for improving the current working process.	The students used mostly acting and connecting ideas while learning as they were implementing plans. When they completed the first stock selling, they tried to inquire for more information to see potential expansion to the business. They discussed, analyzed, and compared the business with other competitors, as well as valued customers' feedback and employees' decisions to continue reproduction.

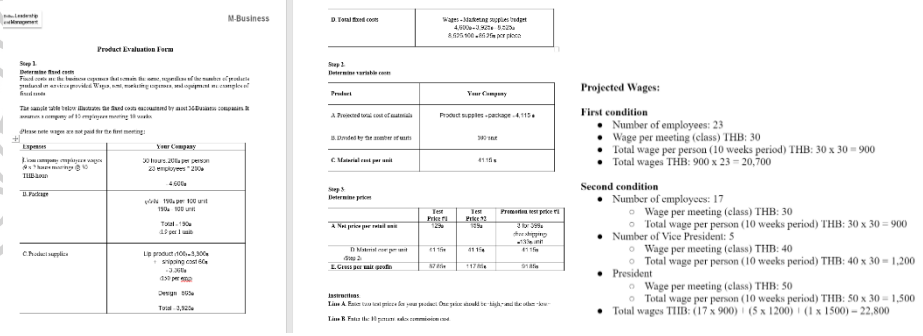
Week	EDIIIS Process	4.a. The ability to apply different problem-solving frameworks to complex problems	4.b. The ability to develop and implement innovative solution options	4.c. The ability to use various processes in learning
10	Stage 6 Summarize and evaluate the results	The student can evaluate various frameworks they used in the class as they summarize the data for the high and low in the final presentation.	Three representatives developed the presentation. Public relations designed the commercial. The rest developed the report. They pointed out the high, low, and big achievements of the project. Hey also can suggest ideas to solve any issues the judges commented	The students can present how they have used various processes in learning and what they have learned from the project.

The students evaluated various problem-solving frameworks to present the highs and lows of the business.

The students designed innovative ways to collect orders and confirm the orders so they can contact customers with different preferences.



The students developed various forms to manage data and connect information from all departments.



The students used various learning processes in learning to determine the best solution framework and the best outcomes in the future.

Figure 22 Examples of students' performance for integrated problem-solving in ESD

5. **The effectiveness of the instructional model to empower collaboration in ESD and the level of skill**

The effectiveness of the model to empower collaboration in ESD is at the Extended Abstract level ($\bar{X}$= 4.44, S.D. = 0.53). Each criterion has an average score that varies from 4.38 to 4.5 levels, and S.D. varies from 0.45 to 0.73. The students developed the highest ability to learn from others. The students developed the least ability to communicate effectively to promote dialogue and negotiation to deal with conflicts.

The Production department has the highest average score ($\bar{X}$=4.61) for collaboration skills in ESD. The Human Resources department has the lowest average score ($\bar{X}$=4.08) for collaboration skills in ESD.

To observe students' weekly performances, the researcher found that the students can participate in groups effectively. For the first few weeks, they could mostly passively participate in a group decision as many of them only listened to others' ideas and vote whether they agreed with them or not. When they had a clear understanding of their roles and work independently more, they could contribute more ideas to the discussion and sometimes lead the groups to make a decision. They mostly learned from others. The teacher was the first learning resource for the first few learning steps, then, the students can exchange ideas with each other more and could even learn from the others outside their company. Lastly, the students could communicate their ideas with simple arguments at first, then develop to promote effective dialogues and negotiate better especially when they have to deal with others and solve conflicts.

The summarized data is presented as follows.

Table 39 The summary of the effectiveness of the instructional model to empower collaboration in ESD by students

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
5.a	The ability to participate in the group decisions	4.46	0.73	Extended Abstract	Two-thirds of the students effectively participated in the group discussion by joining, leading, sharing, and asking for information to help the group make the best decision. Three students participated in a group decision when requested and also shared some ideas. Five students can share ideas when they are needed and were open to others' ideas.
5.b	The ability to learn from others	4.5	0.45	Extended Abstract	More than half of the students actively learned many things from others that they can adapt many ideas they learned to use for themselves in the future. Ten students can passively learn when they observe or listen to others. Only one student tried to learn from others after the mistake has occurred.

No.	Criteria	$\bar{X}$	S.D.	Meaning	Evidence
5.c	The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts	4.38	0.45	Extended Abstract	Almost half of the students used various communication methods and always were careful to promote dialogues and ideas to others to prevent any conflicts. Ten students can communicate with others and comfortably share and discuss ideas. Three students sometimes struggled to communicate or negotiate with others due to inadequate knowledge or uncarefully thoughts.
	Average	4.44	0.53	Extended Abstract	

Table 40 The summary of the effectiveness of the instructional model to empower collaboration in ESD by teacher's weekly observation

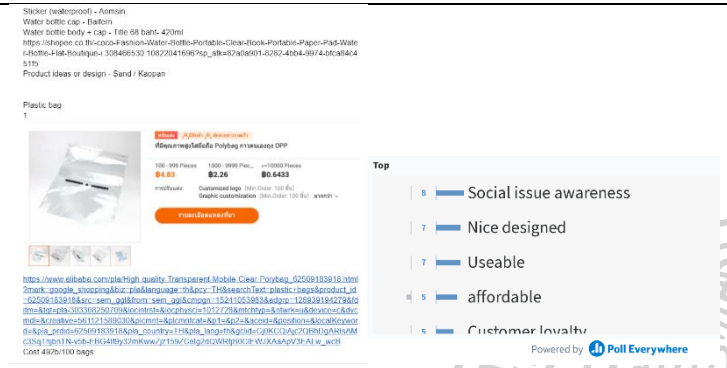
Week	EDIIIS Process	5.a. The ability to participate in the group decisions	5.b. The ability to learn from others	5.c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts
1	Stage 1 Explore the issues	The students participated in the group work at various levels. Nine students have not participated well in sharing, discussing, or deciding ideas when asked. Thirteen students shared some ideas to help the group devise the company-building ideas.	The students learned from teachers and peers while working in a group. However, no clear evidence was found except that they could listen to others' presentations without interruptions. However, one student was found to show no learning attitude as he has not tried to learn the content he did not understand.	All students mainly listened to understand. Most of them could communicate to inform their ideas. Only a few could ask the teacher to clarify the understanding that they were confused about. However, a few students did not try to communicate with others well as they seemed to not grasp the concept of the project yet and only waited for the teacher to guide them.

Week	EDIIIS Process	5.a. The ability to participate in the group decisions	5.b. The ability to learn from others	5.c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts
2	Stage 2 Diagnose the learning needs	At first, the students mostly work separately. Once students formed a department, they seemed to participate in group decisions more. Less than half of the class have taken part in sharing or making a decision in a group. The rest worked on the things they were assigned to.	The students showed some willingness to learn from others but might be limited. As they worked as departments, they showed a willingness to learn from their leaders according to the roles. However, it was mostly to listen to ideas.	Some students communicated a lot to work with others as they discussed starting planning their work. The leader students could communicate effectively to present working plans step by step while comforting their teams to work with no conflict. Some employee students could communicate some ideas while some only passively received information. Four students could promote and negotiate effectively to sell stocks to potential investors.

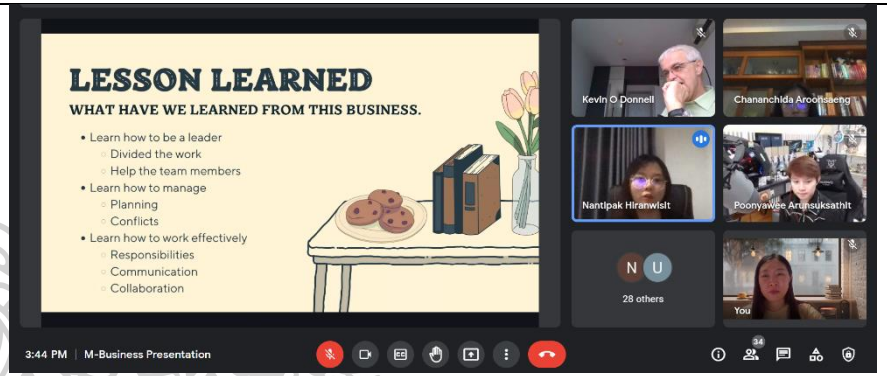
Week	EDIIIS Process	5.a. The ability to participate in the group decisions	5.b. The ability to learn from others	5.c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts
3 - 4	Stage 3 Identify the learning objectives	The students could share and make some decisions in groups simultaneously. Everyone had to make a simple decision without sharing any ideas by approving their Charter and Bylaws. One student couldn't make his decision. Every team worked within their team to complete business plans in which all could share their ideas and make a group decision to finalize the plan together.	The students learned from group discussions mostly. Clear evidence was when many business ideas were not finalized and agreed upon yet. Each team showed very open to listening to other teams' ideas and modified their plans to meet others' preferences. The students could also incorporate others' ideas to apply to their own goals.	Clear evidence could be observed when students had to finalize their company's ideas, product choices, capitalization, and bylaws. They reflected that the student could communicate more effectively to promote their ideas while negotiating with others' ideas to identify the best goals they all agree on together. The leader students can identify their communication goals to continue their work in steps.

Week	EDIIIS Process	5.a. The ability to participate in the group decisions	5.b. The ability to learn from others	5.c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts
5	Stage 4 Identify the learning task and plan	The students shared ideas from the group decisions with the class. All students had made a final decision to approve business plans. They could defend their ideas when the teacher asked. Some students also defended their ideas and convinced others to follow their ideas strongly.	The students listen to others' ideas when each team shared business plans without interrupting. The students could also incorporate others' ideas to apply to their own goals. The students could also create a new plan once they finalized and agreed on their ideas.	The students could communicate clearly to deal with conflicts. Many leaders and followers can promote dialogue and negotiate their ideas while being aware that the new ideas could create conflict with others. However, they could point out reasonable ideas to solve the conflict in the end.
6-9	Stage 5 Implement the plan and monitor the process	The students mostly implemented the plans to meet their previous decisions. At this stage, each of them stepped in to make their own decision to do each action as they had different tasks to do based on each role.	The students learned not from only their teams but also other stakeholders outside their company by creating surveys. The students also created an employee survey to learn deep opinions from each individual purposefully for developing their current plans and making them more effective.	The students can communicate to promote dialogue and negotiate effectively from selling products to customers. They used various communication methods including advertising media, commercials, messages, and direct force sales.

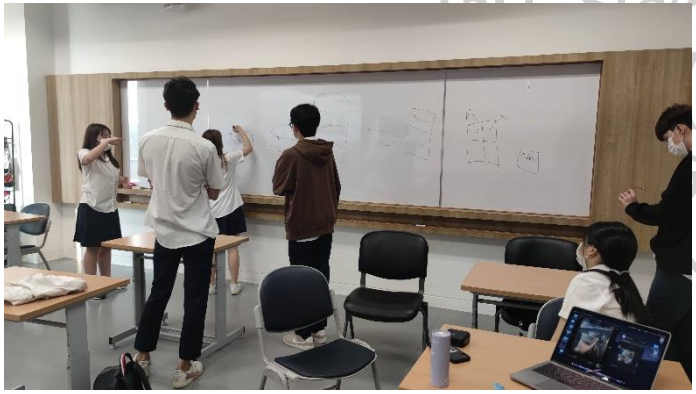
Week	EDIIIS Process	5.a. The ability to participate in the group decisions	5.b. The ability to learn from others	5.c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts
10	Stage 6 Summarize and evaluate the results	Each student had to participate a lot in this final part to summarize the project and write reports. They had to decide what information should be presented in each assignment.	At this stage, students learned from others mostly from the judges' opinions who are two business teachers and three entrepreneurs whom the teachers invited to join the business presentation session. Moreover, they also learned from the other two competitors to corporate all the ideas into their improvements.	Only the representatives of the business who were three presenters could communicate and promote their ideas to answer the judges' questions during the presentation.



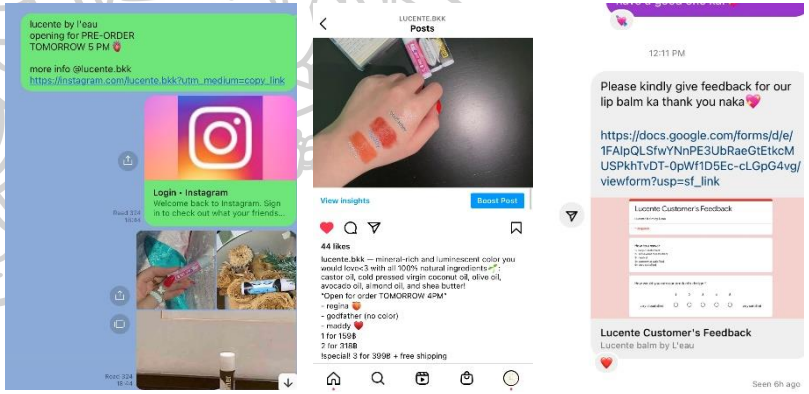
The students participated in group discussions and shared support information to defend their ideas.



The students learned from others and incorporated their ideas.



The students used verbal and nonverbal communication effectively.



The students used various communication methods to promote and negotiate with others

Figure 23 Examples of students' performance for collaboration in ESD

Chapter 5

Discussion and Suggestions for Future Research

The research on the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand aimed to 1) study and develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and 2) study the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills. By studying the effectiveness of the model, the researcher looked into each skill for ESD which has five skills: 1) to study the effectiveness of the instructional model to empower self-awareness in ESD and the level of skill 2) to study the effectiveness of the instructional model to empower system-thinking in ESD and the level of skill 3) to study the effectiveness of the instructional model to empower critical thinking in ESD and the level of skill 4) to study the effectiveness of the instructional model to empower integrated problem-solving in ESD and the level of skill, and 5) to study the effectiveness of the instructional model to empower collaboration in ESD and the level of skill. The summary of findings is presented as follows.

Summary of Findings

1. According to the study of the needs, the data collected from the self-directed readiness questionnaire among 113 students in Business electives revealed that they believed to have high self-directed readiness if the students were allowed to choose their topics but the teacher must provide clear instructions. In terms of

English proficiency, the students are quite capable of expressing their thoughts. However, the teachers agreed that self-directed learning is still a challenge because students are not very good at it, especially when learning new complex content or working individually. According to the experts, it may be beneficial for students to learn from real-life experiences. Meanwhile, the teacher can offer helpful advice and support. Teachers should be able to implement the instructional model more effectively after researching their students' backgrounds. If the teacher is to be successful in implementing the model, the issues must be relevant to the students and must challenge them to investigate and solve. The teacher must ensure that the students have an intermediate level of English language proficiency for them to express their learning. Furthermore, the school must provide adequate support. To assess students' outcomes, differentiated assessments must be used to meet the needs of the students. Finally, the business context can be incorporated into all learning steps to differentiate the model.

The model development results showed that the model consists of five parts which are 1. The principle is The instructional model is designed to empower students' sustainable learning skills which they take important roles in self-direction in learning to change perspectives and behavior with intentions to solve the issues related to challenges and dilemmas of sustainable development goals. 2. The objective is to empower skills for ESD in business studies for international high school students in Thailand. 3. The EDIIIS processes are 1) Explore the issues 2) Diagnose learning needs 3) Identify objectives 4) Identify the learning task and plan 5) Implement the plan and monitor the process, and 6) Summarize and evaluate the results. 4. Measurement and evaluation are skills for ESD: 1) Self-awareness 2) Systems thinking 3) Critical thinking 4) Integrated problem-solving 5) Collaboration. 5. Conditions are 1) The issues must be relevant to students' context and can

influence the students to think more, and 2) Students should have at least basic language function skills or an intermediate level of English proficiency.

2. The effectiveness of the instructional model to empower self-awareness in ESD and the level of skill overall is at the Relational level.

   2.1. The effectiveness of the model to empower self-awareness in ESD is at the Relational level. The students developed the highest ability to move from awareness to knowledge to action. The students developed the least ability to create a clear and valuable vision, and plan for the future. The model can empower the students to understand their needs by being aware of their roles in society. The students improved their ability to set clear visions and plans, then move to actions commitment. Lastly, they can evaluate their situations and plan to deal with the conflicts sharply by also being aware of the impacts on others. The teacher may need to guide them first or when the students face some problems that they do not have the knowledge to solve.

   2.2. The effectiveness of the model to empower systems thinking in ESD is at the Relational level. The students developed the highest ability to recognize and understand relationships in a whole picture. The students developed the least ability to analyze and synthesize embedded relationships among them. The model can help students develop systems thinking skills so they can see the big picture of issues and recognize and understand the relationships between teams so they can contribute to the business. The students also learned to analyze the relationship and synthesize it to create a detailed plan to follow.

   2.3. The effectiveness of the model to empower critical thinking in ESD is at the Relational level. The students developed the highest ability to question current norms, practices, opinions, and beliefs as well as the ability to reflect on one's values, perceptions, and actions. The students developed the least ability to recognize the assumptions underlying our understanding, views, and opinions.

When students have enough information about current issues, the model can help them develop critical thinking skills that will allow them to question them. The teacher must guide and support them in recognizing the problem at first, as well as pointing out the expected outcomes so that the students can form clear assumptions. While working together to develop the business plans, the students also learned to reflect on the ideas and perceptions of others.

2.4. The effectiveness of the model to empower integrated problem-solving in ESD is at the Extended Abstract level. The students developed the highest ability to use various processes in learning. The students developed the least ability to develop and implement innovative solution options. By encouraging students to use various learning processes and tools to design innovative frameworks and make a decision to solve an issue, the model can empower students to develop integrated problem-solving skills. Support from the teacher can help students learn more about the problem and develop more complex solutions.

2.5. The effectiveness of the model to empower collaboration in ESD is at the Extended Abstract level. The students developed the highest ability to learn from others. The students developed the least ability to communicate effectively to promote dialogue and negotiation to deal with conflicts. Because students can participate in group decisions most of the time and can always learn from others when they work cooperatively and coordinately in each learning step, the model can empower students to develop collaboration skills. They also practiced communicating not only with teachers and peers but also with other stakeholders.

Discussion

The results of the development of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand can be discussed as follows.

1. According to the findings of a study and development of a constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand, the model should be designed to allow students to use self-directed learning with well-supported by the teacher. The issues used in the learning steps must be relevant and challenging, while also concluding the business context in each step. According to Khanthasiri et al. (2015); Prasertsuk (2016); Pyykkönen and Kalliomaa (2013); Ramsiri (2013a), using real-life issues of concern to students allows them to motivate and explore their learning while also promoting higher-order thinking, including reflective thinking, through an active and participatory approach. Furthermore, differentiation can be a key to model implementation success because it allows the model to be tailored and flexible to the needs of individuals. This is consistent with Luther's (2000) suggestion that the key ideas for implementing new teaching methods are the need for higher-order thinking and respect for the diversity of learners. The model's validity was determined to be of high quality. This is the outcome of ADDIE-aligned research and development. It allowed the researcher to analyze needs and gaps to understand the guidelines for developing the model and design and develop the model and tools effectively (Kruse, 2009).

The EDIIIS model is developed from the synthesized ideas from the study results of research backgrounds, and fundamental concepts of the EDIIIS instructional model development. The concepts are studied from instructional model concepts, constructivist learning theory emphasizing self-directed learning and issue-based learning, and Education for Sustainable Development. The six steps of learning are 1) Explore the issues 2) Diagnose learning needs 3) Identify objectives 4) Identify the learning tasks and plans 5) Implement the plan and monitor the process 6) Summarize and evaluate the results. In each step, the teacher and students have to work cooperatively and coordinately and students must take the

primary roles to be responsible for their learning, and the teacher only guides and support the students. It results in the model's strength is the integration of self-directed and issue-based learning processes, which allows students to learn with self-direction from motivation while interacting with others in societies as global citizens to solve problems related to sustainable development goals. It corresponds to the concept of effective instruction, which states that teaching is the creation of various environments to facilitate learning so that it is most effective and productive, and that it can stimulate many learning outcomes such as knowledge, skills, and values (Joyce et al., 2015; Sirithanyarat & Laoriendee, 2019).

The model's outcomes result in the development of five ESD skills considered essential for future learners which are 1) Self-awareness 2) Systems thinking 3) Critical thinking 4) Integrated problem-solving and 5) Collaboration. The learning step in the model can be found to precisely develop the five skills as the learning steps meets the principle and characteristics of ESD. The president is found to develop all five skills at the Extended Abstract level as well as all five Vice Presidents. It is because their motivation and personal values are at a higher level compared to the other staff. The process of working in the organization and the policies are also designed to have the team leaders be the key person to approve everything before planning and executing the plans. This is consistent with Brockett and Hiemstra's self-directed model's elements (1991, 2012) and Ma's (2017) self-directed's dimensions that have three elements: 1) person or personal trait 2) context or learning environment, and 3) process or cognitive process. It suggests that effective instruction should have these three elements. Firstly, the person element addresses the individual characteristics, background experience, motivation, personal norms, personal values, or education level. Secondly, the process is facilitated by including the learning organization in planning, executing, and evaluating choices. It also involves personal learning styles, teaching styles, and

possessive skills. Lastly, the context includes social context such as political issues, organizational policies, financial status ar, and power affect the learning climate. The results also meet the requirements of several learning domains, including 1) cognitive domain (knowledge and thinking abilities), 2) socio-emotional domain (social abilities), and 3) behavioral domain (action competencies) (Taimur & Sattar, 2019)

Furthermore, the model enables learners to learn and/or carry out research independently. The ideas that the students lead their own company and design how they want to run the business freely with guidance and support from the teacher also enables them to explore the issues they are interested in and are crucial for themselves. These claims are supported by the issue-based concept that emphasizes how students learn to learn so they can solve problems whilst the problems are meaningful and important to learners. The learners can enhance their creative thinking, analytical thinking, skills to acquire further knowledge, and learning processes through motivational desire to solve the problems, self-directed, and self-assessed behavior (Goh & Yew, 2016; Green & Price, 2019; Ramsiri, 2013a). Students can become more innovative in their learning activities by concentrating on what is crucial to them. In the meantime, the teacher could essentially act as a role model and mediator to assist students in learning. This is consistent with the constructivist theory that a learner creates new knowledge from existing experiences and knowledge with novel concepts or ideas with which they converse in the socio-cultural context that can be meaningful and relevant in the long term (Richardson, 2003; Tobias & Duffy, 2009; Ramsiri, 2013; Wanniarachchi, 2016; Vanichwatanavorachai, 2019).

2. The results of the study of the effectiveness of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand and the level of skills found

that the average level of the 5 skills for ESD is at the Relational level. Overall, the president developed all five skills at the Extended Abstract level due to the role and strong determination of working in such a position. Meanwhile, some departments were also found to develop some skills higher than the others due to their roles and nature of work.

2.1. The result of the effectiveness of the instructional model to empower self-awareness in ESD and the level of skill is at the Relational level. The model can empower the students to understand their needs by being aware of their roles in society. The students improved their ability to set clear visions and plans, then move to actions commitment. Lastly, they can evaluate their situations and plan to deal with the conflicts sharply by also being aware of the impacts on others. The production department has the highest average score. This is because the department's job responsibility concerns the product planning that must work coordinately with the other teams closely in each step. The team had to collect all the ideas from diverse resources not only within the company but also outside the company including manufacturers and retailers. They seemed to have a clear idea about the product goal which results in clear individual goals and plans. Thus, the members of this team might have developed self-awareness skills at the highest level.

2.2. The result of the effectiveness of the instructional model to empower system-thinking in ESD and the level of skill is at the Relational level. The model can assist students in developing systems thinking skills, allowing them to see the big picture of issues and recognize and understand team relationships, allowing them to contribute to the business. The students also learned how to analyze and synthesize the relationship to create a detailed plan to follow. In this skill, the finance department has the highest average score. This is since the finance team must deal with all financial statements and transactions that

are relevant to all other departments. They must be able to see the big picture to manage the company's profitability, as well as carefully analyze the relationship of each transactional link. Each detail has a significant impact on the total number, so they may have developed the systems thinking the most among the other departments.

2.3. The result of the study of the effectiveness of the instructional model to empower critical thinking in ESD and the level of skill is at the Relational level. the model can assist them in developing critical thinking skills that will allow them to question any suspended actions or issues. The students can form clear assumptions. While developing the business plans, the students learned to reflect on the ideas and perceptions of others. The human resources department has the highest average score in this skill. This is due to the roles of the team concerned with building up the business including outlining the Bylaws which project the salary, wages, capitalizations, and overall operational plan of the members. They had to project clear assumptions of the outcomes of the company before planning them. This department is the only team that must observe an individual's behavior and performance routinely, they must always question any issues that occurred with any members including concerns and challenges. Thus, they must also develop their ability to reflect on a person's values, perceptions, and actions the most.

2.4. The result of the study of the effectiveness of the instructional model to empower integrated problem-solving in ESD and the level of skill is at the Extended Abstract Level. The human resources department has the highest average score in this skill. Since the team had to maintain a good workflow and environment in the company at all times, they had to deal with a variety of issues at all times by employing various methods to solve the various issues. Furthermore, because they had to work from the beginning stages of building

the company to the end stages of evaluating performance and productivity, the team was able to use more diverse learning processes than the other teams, resulting in higher integrated-problem solving skills.

2.5. The result of the study of the effectiveness of the instructional model to empower collaboration in ESD and the level of skill is at the Extended Abstract level. The model can empower students to develop collaboration skills as it is a class project in that students had to work in separate departments but within the same company. The students worked cooperatively and coordinately in each learning step, so it allowed them to always learn from others. They also practiced communicating with stakeholders other than teachers and peers. The production team has the highest average score in this skill. This results from the scope of work that students had to contact various groups of people to plan their production including manufacturers, intermediaries, customers, and employees. This allowed them to have collected more information which made them confident to participate in group decisions, majorly in leading the discussion to decide with the others. Accordingly, they developed the communication skills and other skills from working with the others which led to the highest score in collaboration.

To assess students' performance by department, the production team outperformed the other team in terms of self-awareness and collaboration skills. The reason could be that the department's employees were required to investigate product development ideas. As a result, they could gather more information to better determine their options and evaluate their ideas. Furthermore, they were required to always share ideas within their teams to adjust any plans and choose data to be interpreted, and be presented to the other teams while addressing their needs and concerns. As a result, self-awareness and collaboration skills were successfully developed. The finance team, on the other hand, excelled at developing systems thinking skills. This meant dealing

with a variety of complex sources of information, particularly budgeting and financing from each team. They had to balance all of the financial statements, which allowed them to develop the big picture as well as the relationship between each small number from various resources. Human resources have been discovered to develop the majority of critical thinking and integrated problem-solving skills. This could be because they had to manage the company's overall operational plans as well as the well-being of the employees. This meant they had to keep an eye out for any suspicious incidents to solve any problems that arose and devise plans to avoid problems in the future.

On the other hand, the public relations team was discovered to have less developed skills. The team scored the lowest in three skills: self-awareness, systems thinking, and integrated problem-solving. The reason for this could be that the team focused primarily on the final presentation of information to be presented to outsiders of the organization. This means that they can only see the big picture once it is completed, but it is not clear how the ideas were developed and linked. They appeared to handle less on operational parts, which prevented them from clearly understanding the ideas behind the presentation. Less information not only prevents them from developing self-awareness but also prevents them from solving any problems. Surprisingly, the marketing team has the lowest critical thinking skills development score. Their job is to develop a business plan. However, the reason could be that they encountered numerous issues while collecting survey data from prospects and customers as part of the hybrid learning challenge during the project. This may prevent them from effectively gathering enough knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. Finally, human resources are found to have the lowest score in terms of collaboration skill development. This may appear to be in contrast to the expectations of their roles, which emphasize team collaboration. This could be because they also had to deal with various conflicts. This can sometimes make it less pleasant for others to collaborate with them. The students are also unfamiliar with

one another because this is the first project on which the entire class has collaborated. This may have an impact on how the team collaborates with the others.

Because of the role and the strong determination required to work in such a position, the president developed all five skills at the Extended Abstract level. Meanwhile, due to their roles and the nature of their work, some departments were discovered to develop some skills more than others. This was consistent with the concept of the self-directed learning model proposed by Brockett and Hiemstra (1991, 2012) and Ma (2017b) that an effective self-directed model should include three components: person, process, and context. To begin, the "Person" demonstrated that the student's characteristics, background experience, motivation, personal norms, and personal values differed depending on their roles within the company. Many team leaders were also discovered to develop higher levels of skills than other members due to their greater responsibility and values toward the team. Second, the organization's "Process" requires that everything be approved or discussed with the leaders first in planning, executing, and evaluating options. Finally, the "Context" component includes organizational policies and issues that students must deal with. This leads to greater development among leaders and members of certain departments. Because each department has different working processes and possessive skills, some departments must develop certain skills more than others. Personal learning styles, teaching styles, and possessive skills are also factors.

In conclusion, the created model has been found to have a satisfactory influence on empowering students' five stills for ESD to relational level in overall abilities, despite their diverse backgrounds and aspirations to satisfy their desires. This can contribute to ESD studies that are now concentrating on higher education (Cebrián et al., 2021), since the research can exhibit the impact of employing the instructional model to empower ESD in secondary school level, which demonstrates strong empowerment to students.

The model's strength is that it combines the highlight of self-directed learning, which allows students to drive their learning from their passions and needs, as well as direct their ways of learning to achieve different goals, with the highlight of issue-based learning, which also allows students to identify needs by exploring issues happening in the modern world that are relevant to the sustainable development concern.

Suggestions

Suggestions for the model implementation

1. Experts evaluated the quality of the developed model, indicating that it can be used in a classroom setting. This model can be used in the classroom by any teacher who wants to use an instructional model to improve ESD skills. The uniqueness of the model is its flexibility and not time-bound. This allows the model to be able to use in many learning contexts. In this research, the model is implemented during the hybrid learning setting, and also full online learning for some weeks. Due to the Covid-19 situation. However, the model can still empower the skills for ESD at the rational to Extended Abstract level in some skills. This proves that the model can be used in various learning designs. The timing can also be adjusted to meet the sizes and nature of the project as well. The researcher found that the fifth learning process, to implement the plan and monitor the process consumed the most time in the project. This is because the students will majorly take the key roles in their learning individually mostly when they have clear responsibilities and adequate knowledge to implement the plans. This requires a longer time for the students to take action according to their plans especially if they have more than one plan to work on or find any unexpected issues during the implementation and monitoring of the plan.
2. The EDIIIS model focuses on business studies students so a teacher can emphasize the use of business context while implementing the model. A preliminary survey allows the teacher to understand student backgrounds, social trends, school

contexts, or community concerns which enables effective lesson planning to meet the student needs and social needs. Moreover, the teacher can use guiding questions and good assessment systems such as checklists, worksheets, or rubrics to allow students to monitor their learning better. The teacher can also observe actions and the result during the student's self-directed learning to assist student learning such as giving useful feedback or supporting them so they are confident to improve themselves.

3. The school that intends to use the model to empower students' skills for ESD must recognize that improving educational quality for ESD must be done collectively by all stakeholders. It is not merely a topic in school to teach students about the issues of sustainable development; it must be integrated into all classrooms so that it becomes culture. Students should be permitted to study freely, not restricted by grades or academic achievements, but also by satisfying their real-life needs and concerns. School must provide support as well as community and parents.

Suggestions for Future Research

1. The model's primary goal was to focus on business studies students in international demonstration schools. However, the learning processes are believed to be applied to a wide range of subject areas as the learning processes are developed from the synthesis of the self-directed learning and issue-based learning concepts brought from general concepts that are relevant to the skills for ESD. If future research can try implementing the model with other subject areas, the assumption can be seen similarly to this research's findings. This must allow the model to be tailored to the needs of teachers, students, and the school environment in wider ranges.
2. In this study, students were assigned to different positions with varying levels of responsibility. This caused students to work unequally since students in higher positions may have more work to care after. Meanwhile, certain departments may

not be completely involved in all project processes as successfully as others. This may result in varied levels of skill development among students. If the model is used in the future in a class where students are permitted to work on the same tasks with equal responsibility, the outcomes may add to the model's efficacy even more significantly.

Various measuring methods may be employed to assess the efficiency of the model in empowering ESD skills to achieve varying efficacy results. As in the study, the researcher employed a single evaluation form with a rubric to assess model efficacy following model deployment as the summative outcome. Even though the researcher attempted to use formative data obtained during learning as evidence to satisfy each level offered by students, as well as teacher observation during learning, a better tool to discuss the results more fully may be developed. If there is a tool that can also examine the student's pre-levels of the abilities to be compared with the skill levels after using the model, or even a tool to assess progress during or after the project, the model's efficacy may be observed more clearly.

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APPENDIX A

Expert Panel

List of experts for Content Validation

1. Emeritus Professor Dr. Wariya Chinwanno	The Director, Mahidol University International Demonstration School
2. Dr. Stephen Coryelle	Deputy Director of Academics, Mahidol University International Demonstration School
3. Mr. Matthew Allsopp	Head of Modern Languages Department, Mahidol University International Demonstration School
4. Mr. David Gallagher	ELL Coordinator, Mahidol University International Demonstration School
5. Mr. Teeraphan Prathomkhong	Mahidol University International Demonstration School
6. Mr. William Kloster	TEFL Director and Trainer at WECI TEFL, and teacher at Brown Middle School, Hillsboro, Oregon

มหาวิทยาลัยศิลปากร

List of professionals for the evaluation of the quality of the model, the model manual, the Unit Plan, and the skills for ESD evaluation form

1. Asst. Prof. Dr. Maream Nillapun	Faculty of Education, Silpakorn University
2. Asst. Prof. Dr. Chanasith Sithsungnoen	Faculty of Education, Silpakorn University
3. Assoc. Prof. Dr. Marut Patphol	Graduate School, Srinakharinwirot University
4. Asst. Prof. Dr. Rujiraporn Ramsiri	Kasetsart University Laboratory school Kamphaeng Saen Campus
5. Dr. Suwimon Saphuksri	Faculty of Education, Silpakorn University
6. Dr. Songtham Vongvirulh	Faculty of Arts and Science, Kasetsart University
7. Dr. Kanok Jantra	Chulalongkorn University Demonstration Secondary School

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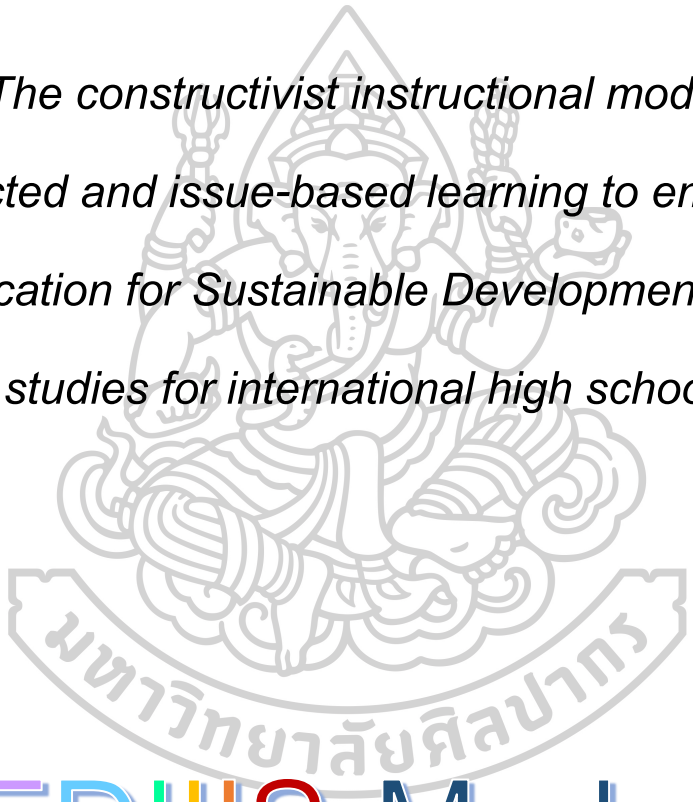
APPENDIX B

Manual for the constructivist instructional model using self-directed and issue-based learning to empower skills for Education for Sustainable Development in business studies for international high school students in Thailand

Manual

The constructivist instructional model using self-directed and issue-based learning to empower skills for Education for Sustainable Development in business studies for international high school students in Thailand



EDIIIS Model

By Piyawan Sunasuan

PREFACE

This Manual is a guide for using the constructivist instructional model using self-directed and issue-based learning to empower skills for Education for Sustainable Development in business studies for international high school students in Thailand (EDIIIS Model). It provides important information and instructions to those interested in applying the constructivist instructional model to understand the principle and elements before using them in the classroom.

The model aims to empower students' Education for Sustainable Development which focuses on 5 skills including 1) Self-awareness 2) Systems thinking 3) Critical thinking 4) Integrated problem-solving, and 5) Collaboration. The student should effectively empower the skills to change perspectives, which focuses on independent higher-order thinking skills and change behavior to meet the goals of education for sustainable development. This manual would enable the user to apply the model in a classroom effectively to meet the goal of the model.

Piyawan Sunasuan

Ph.D. candidate in curriculum and instruction

Graduate School, Silpakorn University

GUIDELINES FOR APPLYING THE EDIIIS MODEL

The EDIIIS model was designed to empower skills for ESD in business studies for international high school students in Thailand. Please read this instruction manual and its appendix carefully prior to application to ensure effective and correct use.

Guidelines for teachers

1. Read and study the model manual including fundamental concepts of the model development, unit plan example, and evaluation tool example
2. Prepare the learning materials
3. Prepare the measurement and assessment tools
4. A preliminary survey of students can be conducted in advance to understand student backgrounds, social trends, school contexts, or community concerns to support the model's use.
5. When using the model, the teacher can ask guiding questions, use good assessment systems, and observe actions and results as ongoing feedback for improvement during student learning.

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INTRODUCTION

The term "Education for Sustainable Development," or ESD, was first used at a UNESCO conference in 1997. The conference emphasized the transformation of the new vision toward the role of education and public awareness. Sustainable development was established as a long-term goal in which education is intended to change individual behavior and lifestyle. Individuals and the general public are expected to be better prepared for the transition to globalization through knowledge dissemination and skill development (UNESCO, 1997). It emphasized the importance of ESD in achieving sustainability goals for all nations. It was addressed that education reconstruction should be made mandatory because it provides genuine long-term learning opportunities in the modern world as "quality education." In recent years, the emphasis on skill development has grown in the educational trend. Learners are expected to improve their learning process rather than simply passively receiving content from instructors.

Interdisciplinary learning is required to create "meaningful learning" following the UNESCO learning module for sustainability (Cox, Fien, & White, 2010). According to the module, the integration of knowledge from various perspectives will discrete learners' long-term knowledge. Since then, ESD pedagogies in both primary and secondary schools have shifted slightly from teacher-centered to student-centered instruction (UNESCO, The education for sustainable development sourcebook. Education for Sustainable Development in Action, Learning and Training Tools No. 4, 2012a).

The ESD emphasizes long-term skill development and is directly related to high-quality education. Thus, to empower skills for ESD, the constructivist instructional model using self-directed learning and issue-based learning would allow students to develop cognitive skills, socio-emotional skills, and behavioral skills to become lifelong learners in the future.

FUNDAMENTAL CONCEPTS OF THE MODEL DEVELOPMENT

The study of constructivist learning theory, self-directed learning, issue-based learning, and ESD concept is composed of the fundamental concepts to develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies. The ESD concepts were studied to synthesize the essential skills required to achieve the goals. It is depicted in the figure below.

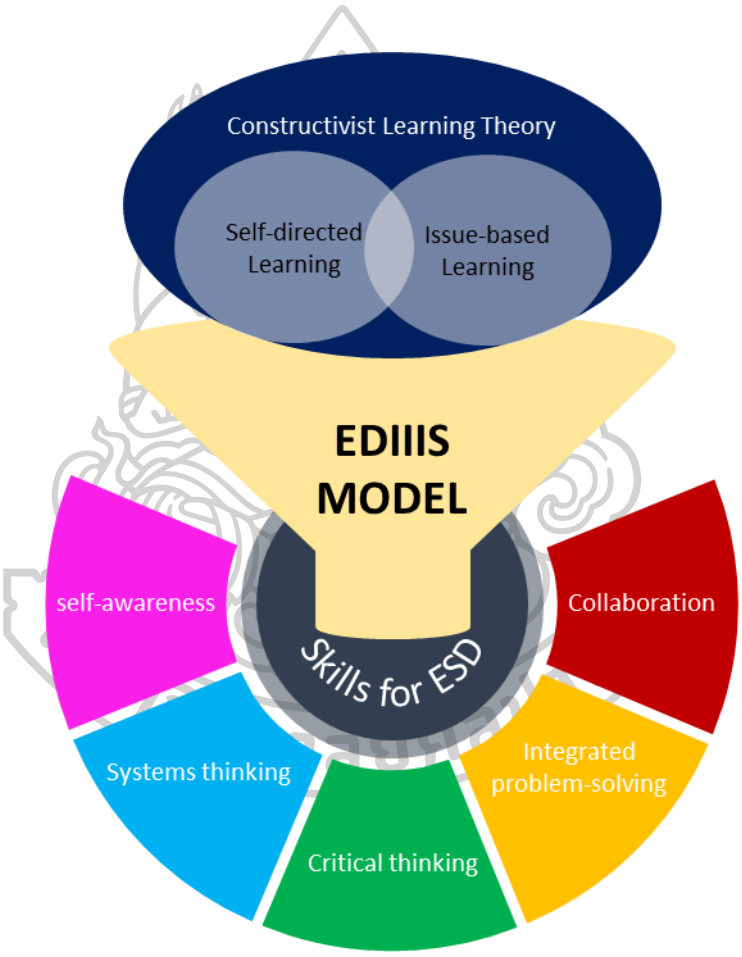


Figure 1: Fundamental Concepts of the EDIIIS Model development

Constructivist Learning Theory

Constructivism is a learning theory that relates to a learner's developmental learning process of constructing knowledge from his or her experience, social and cultural context, as well as new ideas or concepts that they come into contact with. It

entails the cognitive process of learners actively learning with the help of their context. As a result, the constructed knowledge would be meaningful, as it would be derived from truths and relevant experiences. Using constructivism in instructional design necessitates the development of an effective plan, as well as guidance and support materials such as various cases or examples, tasks that allow students to improve higher-order thinking, and a variety of activities. Furthermore, the teacher would play an important role in facilitating and encouraging students throughout their learning progress, as well as serving as a learning model for them. Students should be encouraged to discuss, exchange, and receive various ideas from various perspectives, viewpoints, and examples to enhance their learning while also bringing their previous knowledge or experience to be accommodated in constructing new knowledge (Richardson, 2003; Tobias & Duffy, 2009; Clark, 2009; Ramsiri, 2013; Kapur, 2019).

The constructivist learning theory was used to guide classroom learning management to support students' learning in constructing knowledge, while the model is driven by self-directed learning and issue-based learning approaches. It can be summarized that the teacher and students are attempting to understand their roles in the following ways.

Roles of teachers

1. The teacher is a model of learning who should facilitate, support, and guide students to learn while students construct their knowledge.
2. The teacher should motivate student learning by challenging students with real context, and real examples relevant to students' interests.
3. The teacher should create a sociomoral atmosphere in the classroom that enables students to learn from having social interaction and advance their learning in various ways.

Roles of students

1. Students should be active and determined by their intrinsic motivation and involvement in society.
2. Students need to fully respond to their learning. They should direct their learning with self-regulation to learn on their own.
3. Students should establish their higher-order thinking while engaging in learning in classrooms along with the achievement of academic goals.

Self-directed learning

Self-directed learning is a necessary component of adult development and a prerequisite for life-long learning (Knowles, 1975). It is a learning process in which individuals direct their learning paths from the initiative process to the end, and teachers serve as facilitators by providing useful feedback as guides (Knowles, 1975; Brockett & Hiemstra, 1991; Brookfield 2009). According to Brockett and Hiemstra (1991), self-directed learning can work in two ways: an internal change process and an instructional process that is dependent on the learners. They operate in a manner that is similar but not identical. By going over twenty-three major definitions of self-directed learning dating back to 1960 and the most recent proposed in 2000. It has been discovered that the slight shifts in SDL definitions and concomitant paradigm, which fall into three major dimensions; learning environment, personal attributes, and cognitive/ psychological process, are still embedded in the newer one respectively. These depict the characteristics of SDL learning, which are divided into three categories: person, process, and context (Ma, 2017; Brockett & Hiemstra, 1991).

However, this does not imply that self-directed learning is only effective for individuals. Cooperative and collaborative learning can also be tailored to the needs of the learner (Grow, 1991, 1996; Brookfield, 2009; Lubbe 2015). The researcher has distilled the processes of self-directed learning into five steps: 1) Identify learning needs

2) Establish goals. 3) Create a learning plan. 4) Put the process into action and monitor it, and 5) evaluate and reflect on what you've learned.

The researcher incorporated the five processes of self-directed learning into the constructivist instructional model's learning processes. This would enable the ESD skills that focus on self-direction in learning, as students are thought to need to develop an individual mindset, wisdom, and behavior through intrinsic motivation.

Issue-Based Learning

In ESD and business education, issue-based learning (PBL) or problem-based learning (PBL) is frequently used. PBL is commonly referred to as a student-centered approach in adult education that focuses on knowledge, knowledge acquisition, and knowledge application, as well as long-term knowledge retention (Van Den Bossche, Regers, Gijbels, & Dochy, 2002; Yew & Goh, 2016). The researcher has broken down the issue-based learning process into six steps (Pyykkönen & Kalliomaa, 2013; Ramsiri, 2013; Khanthasiri, Nuangchalerm, & Wongchantra, 2015; Prasertsuk,2016) which are 1) Explore and prioritize the issues 2) Understand the problem 3) Identify the learning tasks and plans 4) Implement the plan and learn 5) Summarize and present the solution, and 6) Evaluate results.

The researcher incorporated the six processes of issue-based learning into the constructivist instructional model's learning processes. As a result, the EDIIIS model was created to help students develop ESD skills that are relevant to their social awareness as global citizens, as they work to solve issues related to the challenges and dilemmas of achieving sustainable development goals.

Education for Sustainable Development (ESD)

Since UNESCO declared ESD to be a significant global goal, numerous ESD studies have been conducted. Education for sustainable development refers to learners'

life-long learning in three major areas: social, economic, and environmental issues (Mckeown, 2002; UNESCO; 2005, 2012, as cited in Juárez-Nájera, 2015; UNESCO, 2017; Raufflet, Blanchard, & Dupre, 2009). Thus, ESD principles aim to develop both intrinsically and extrinsically. Learners are expected to develop individual mindsets, wisdom, and behaviors to respond to global sustainability needs (Payutto, 2018). Payutto contends that the three learner skills, in addition to the four areas of human beings, society, nature, and technology, should be developed. As a result, they improve both the quality of education and the quality of life. They also ensure a long-term future. The goals of education for sustainable development imply that stakeholders collaborate to meet the needs of the government, community, school administrators, teachers, and even learners. The researcher is focusing on the outcomes of learners in this study to determine what skills learners should have to meet the Sustainable Development Goals.

The researcher studied the ESD concept to clarify the necessary skills for students to possess to meet the needs of international high school students and discovered the following six ESD skills.

6. Self-awareness

Self-awareness is the third of four levels of consciousness (Morin, 2011). It demonstrates higher reflective thought than consciousness and is relevant to self-awareness by itself or by others. In ESD, self-awareness refers to the ability to be aware of one's abilities, strengths, weaknesses, and limitations, as well as to set and achieve goals and plans. It also encourages a person to consider the presence of self and one's role in the community and globally. This would assist the individual in driving the values that he or she wishes to develop sustainably (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). This refers to an individual's self-commitment as well as an awareness of community value (Payutto, 2018).

Self-awareness in ESD refers to the ability to:

1) Be aware of one's needs by reflecting on his/her role in society
2) Create a clear and valuable vision, and plan for the future
3) Move from awareness to knowledge to action.
4) Evaluate and assess the consequences of actions to deal with conflicts and changes

To assess self-awareness, the tool should focus on making an individual aware of their statements, reflective thoughts toward self-relevant to sustainable goals, and evaluating self to set goal process so that they can fully commit to their goal with motivation (Ashley & Reiter-Palmon, 2012; Clawson et al., 1985; Zaffiro et al., 2020a).

The self-awareness in ESD can be improved by practicing their mind, body, and mind and body together. He or she can concentrate on valuable self-reflection or the reflections of others. The mind should concentrate on the present moment to set goals that are important to both oneself and others. At the same time, to achieve the goals, he or she must first understand one's strengths, weaknesses, and limitations so that one can devise action plans and know when to seek assistance (Lopez, 2017; Zaffiro et al., 2020a).

7. Systems thinking

Systems thinking is the process of thinking about how a person can see the relationship of the entire complex system (Zaffiro et al., 2020a). It is the ability to recognize and comprehend relationships; analyze complex systems; consider how systems are embedded within various domains and scales, and deal with uncertainty. It demonstrates that a person should be able to see the big picture as a whole, even if it is complex. However, the individual must be aware of the complexities and be able to deal

with them. It enables the individual to comprehend the complex relationships that exist in systems that are embedded as wholes and to deal with uncertainty (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). The concepts can be linked to wisdom development by Payutto (2018), which focuses on acknowledging and balancing behavior and mind. To deal with uncertainty, it suggests that the person adjusts and balances their thinking and action.

Systems thinking in ESD refers to the ability to:

1) Recognize and understand relationships in a whole picture
2) Analyze and synthesize embedded relationships among them

A mental model is an appropriate tool for assessing systems thinking because it can assess how a student understands concepts and solves problems in complex systems (Fraune, 2013)

A teacher can use a mental diagram, such as a causal loop diagram, to map students' ideas of the whole system relationships and learn the complex interactions to improve systems thinking (Atwater & Pittman, 2006).

8. Critical thinking

Critical thinking skills are higher-order thinking abilities that include the ability to think logically and cognitively. It is strongly related to higher-order thinking in academic literacy (Bloom et al., 1956; Laoriendee, 2011; McKeown, 2002; Panich, 2012) and is also one of the necessary skills for fostering long-term understanding and development in students (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). McKeown (2002) claims that critical thinking in ESD is primarily concerned with value issues. Critical thinking, it is argued, entails the ability to question, recognize, evaluate, and infer conclusions. It claims to work in tandem with problem-solving abilities, which could lead to confidence in addressing

issues of sustainable development (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; UNESCO, 2017). This is related to critical thinking in the ESD concept proposed by Raufflet et al. (2009), as it entails learning to question and recognize assumptions to examine the major structures in sustainable development.

Critical thinking in ESD refers to the ability to:

1) Question current norms, practices, opinions, and beliefs
2) Recognize the assumptions underlying our understanding, views, and opinions
3) Reflect on one's values, perceptions, and actions

The following five abilities can be used to assess critical skills for sustainable development (Moore & Parker, 2015; Nachairit, 2014; Watson & Glaser, 1964-2002).

1) Assumption Recognition: A critical thinker should be aware of the various sources of information but should be able to identify and select the correct assumption based on good decision-making.
2) Interpretation: A critical thinker can think logically to interpret ideas that go beyond references and facts and lead to appropriate consumption.
3) Induction and deductive reasoning: A critical thinker can draw conclusions based on facts or undeniable data based on experiences. Among contradictory, insufficient, or ambiguous information, he or she can recognize and identify rational claims that lead to reasonable conclusions.
4) Assess the credibility of collective pieces of evidence: A critical thinker can offer a variety of professional evidence-based sources. The evidence should be relevant, correct, and precise to support the conclusions of ideas.
5) Evaluation: A critical thinker can logically organize and construct the final evaluation based on the arguments and evidence.

A teacher should facilitate students' work through well-designed instruction and a classroom environment to prepare students in advance to be confident in sharing their ideas with peers to improve students' critical thinking. The instruction should follow Bloom's taxonomy of six levels of thinking, progressing from basic conceptual understanding to application of knowledge in real-world problems (Atkinson, 2019; Gerald, 2013; Nonis & Hudson, 2019).

9. **Integrated problem-solving**

It is the ability to solve problems using various methods and competencies (Aamodt, 1991; UNESCO, 2017). It is based on UNESCO concepts from 2005 and 2012 to focus on problem-solving skills to address and solve the dilemmas and challenges of sustainable development. It mentioned using a variety of methods in the learning process to solve problems that are both locally and globally relevant. According to McKeown (2002), one key competency is the ability to integrate multiple processes such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing to solve a problem. This concept is based on Payutto's (2018) wisdom development concept, which addresses the use of metacognition to solve a problem through a variety of methods (both qualitative and quantitative).

In summary, integrated problem-solving in ESD is the ability to:

1) Apply different problem-solving frameworks to complex problems
2) Develop and implement innovative solution options
3) Use various processes in learning such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing

A rubric assessment is an appropriate tool for assessing integrated problem-solving skills. It addresses the levels of achievement in each integration because the

skill refers to the use of multiple methods and frameworks for problem-solving (Eisenberg & Berkowitz, 1987, 2018).

To improve integrated problem-solving skills, a teacher should design effective instruction that focuses on the transition from conceptual understanding to real-life problem-solving. The problem-solving model is used in the instruction, but the learning resources should encourage students to engage in problem-solving and think logically, precisely, and concisely (Chong et al., 2019).

10. Collaboration

Collaboration inspires a group to develop shared values to cooperate with social responsibility. It can lead to novel working methods, the mobilization of difficult-to-access expertise, and the establishment of shared accountability in a more complex world (Albrectsen, 2017; Reeves, 2019). It focuses on the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting (McKeown, 2002; Raufflet et al., 2009; UNESCO, 2017). It allows the individual to participate in making decisions about themselves while also empowering various people and groups (UNESCO, 2005, 2012: cited in Juárez-Nájera, 2015; Raufflet et al., 2009). It is consistent with the ESD concepts in Buddhism that a person should behave well in his or her way of life and not encroach on the rights of others. The individual should be aware of his or her role in the community and be positive to others, not only to other people but also to nature (Payutto, 2018).

In summary, collaboration in ESD refers to the ability to

1) Participate in the group decisions
2) Learn from others

3) Communicate effectively to promote dialogue and negotiation to deal with conflicts

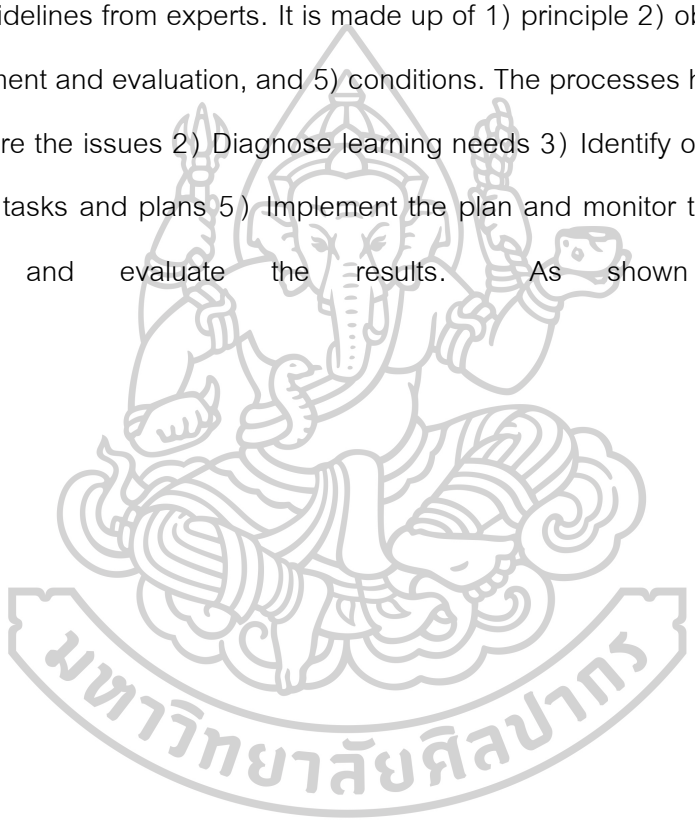
A self-evaluation tool is useful for assessing collaboration because it allows a student to check and evaluate his or her performance to be aware of personal goals, contributions, communication with others, and collaboration with peers (Borden & Perkins, 1999).

To improve collaboration, a teacher should encourage a collaborative classroom in which learners and teachers can design and share learning and authority collaboratively (Tinzmann et al., 1990). Effective communication, appropriate instructions, material use, and group processing must all be addressed while maintaining positive independence and individual accountability. Interpersonal skills among and within groups, as well as real-time interaction, are essential (Ibrahim et al., 2015).

Finally, the researcher investigated the ESD concept to determine the clear outcomes that students are aiming for and the criteria to be observed. This would enable any teacher to integrate the ideas to design learning activities in classrooms and assessment tools to serve differentiation in individual students' learning, allowing the model to be used most effectively.

THE COMPONENT OF THE EDIIIS MODEL

The researcher can develop the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand called the "EDIIIS" model from studies of the fundamental concepts of model development and studies of the basic information to understand the statements of problems and needs of the learners and teachers including guidelines from experts. It is made up of 1) principle 2) objectives 3) process 4) measurement and evaluation, and 5) conditions. The processes have 6 stages which are 1) Explore the issues 2) Diagnose learning needs 3) Identify objectives 4) Identify the learning tasks and plans 5) Implement the plan and monitor the process, and 6) Summarize and evaluate the results. As shown in Figure 2.



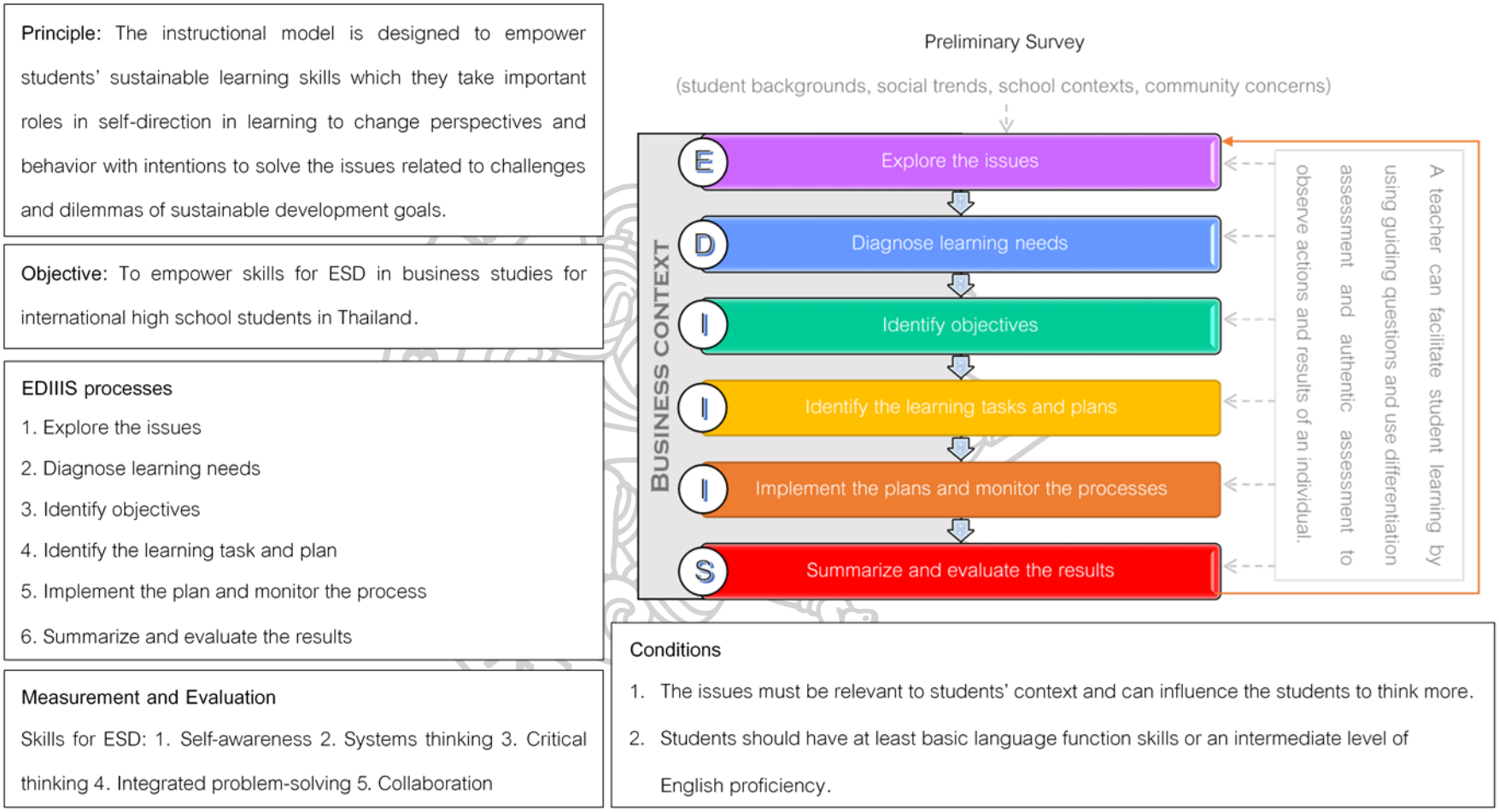


Figure 2: The constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies (EDIIIS Model)

The constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand could be explained as follow.

Principles

The instructional model is designed to empower students' sustainable learning skills which they take important roles in self-direction in learning to change perspectives and behavior with intentions to solve the issues related to challenges and dilemmas of sustainable development goals.

Objectives

To empower skills for ESD in business studies for international high school students in Thailand

EDIIIS Processes

It consists of 6 steps as follows.

1. Explore the issues
   - A teacher guides the students to understand the fundamental concepts of the subject content to assist students to explore the issues. The teacher facilitates the learning by using guiding questions or providing learning materials such as case studies, sample projects, news, or websites to enable students to explore the issues.
   - Students apply the various process in learning to explore the issues such as researching, inquiring, choosing, brainstorming, and prioritizing the issues to find what issue is more interesting and more relevant to them and society including meeting the sustainable development goals.
2. Diagnose the learning needs

- The teacher encourages students to diagnose their learning needs to solve problems. The teacher can introduce some assessment tools to help students diagnose learning gaps, such as SWOT analysis, SMART goals, and WOOP.
- Students actively diagnose their learning needs from their intrinsic motivation and involvement in society. The students must be honest to assess themselves to understand and diagnose gaps in learning effectively. Thus, the needs are relevant and important for the learner, and realistic within their social context. It should highlight the gap between the learner's current stage and the goal he/she wants to achieve which can be a personal desire or skill development.

3. Identify the learning objectives
   - The teacher motivates students to identify the learning objectives that are specific to their needs.
   - Students define the goals of the outcomes. Without specifying the methods of learning, the objectives should be the final outputs of what will be achieved. The teacher should empower and motivate students to set learning goals, which increases students' self-motivation.
4. Identify the learning task and plan
   - The teacher motivates students to identify the learning task and plan by guiding the students to begin the planning process. The teacher can use guiding questions to assist students to create plans that are appropriate to the student's learning styles. The teacher and the students can collaboratively design the planning process.
   - Students determine the learning task and strategies for each goal. The students devise strategies for achieving each of them. Students should identify the pieces of evidence, which could include both material objects and human resources,

that must be gathered to indicate the degree to which each objective was met. The verification must specify the specific method of evidence used in judging each criterion. The learner specifies which criteria will vary based on the type of objectives. Then, students plan which learning strategies or tools will be most effective in meeting the objectives. They should include information on learning resources, evidence of accomplishment, and how the evidence will be validated.

5. Implement the plan and monitor the process
   - The teacher assists students in their implementation process by providing advice and feedback. If necessary.
   - Students are entirely responsible for carrying out the plan and monitoring their progress. They could consult with peers or teachers, or they could seek expert advice and feedback on their learning. This can be done before, during, and after putting the plan into action. If the first idea does not work out, students should manage their stress and conflict while monitoring their learning and should not be afraid to adapt to the learning plan.
6. Summarize and evaluate the results
   - The teacher assists students in summarizing and evaluating the outcomes of their actions. The teacher may employ a variety of assessment tools to allow students to assess their performance. The evaluation should place a greater emphasis on formative assessment than summative assessment.
   - Students summarize and evaluate the outcomes in the productivity and learning process. The students should understand how they learn and what learning process affects their learning ability in particular ways. Students evaluate their learning both for meeting learning goals and their learning processes.

Furthermore, students should be able to suggest, recommend, or plan for future usage.

Because the EDIIIS model is designed for business studies students, a teacher can emphasize the use of business context when implementing the model. A preliminary survey allows the teacher to understand student backgrounds, social trends, school contexts, or community concerns, allowing for effective lesson planning to meet the student's and the community's needs. Furthermore, the teacher can use guiding questions as well as good assessment systems like checklists, worksheets, or rubrics to help students better monitor their learning. The teacher can also observe actions and outcomes during self-directed learning to assist student learning, such as providing useful feedback or supporting them so they are confident in their ability to improve themselves.

Measurement and Evaluation

There are 5 skills for ESD as follows.

1. Self-awareness refers to the ability to reflect perceived experiences within a multidimensional phenomenon while also being aware of personality traits, goals, emotions, attitudes, preferences, intentions, and so on to move to action in the future. The self-awareness in ESD addresses reflecting on one's role in a community that shares the values and principles that underpin sustainable development and society to set visions and plans for the future. It must meet the following requirements.
    1) The ability to be aware of one’s needs by reflecting on his/her role in society
    2) The ability to create a clear and valuable vision, and plan for the future
    3) The ability to move from awareness to knowledge to action.

4) The ability to evaluate and assess the consequences of actions to deal with conflicts and changes

2. Systems thinking refers to the ability to see the big picture of a whole system in complex relationships and comprehend its dynamic interactions and feedback loops, which are characteristics of complex adaptive systems. Systems thinking in ESD addresses how a person recognizes, links, and synergizes embedded relationships while solving problems to synthesize various concepts. It must meet the following requirements.
    1) The ability to recognize and understand relationships in a whole picture
    2) The ability to analyze and synthesize embedded relationships among them
3. Critical Thinking refers to the ability to think logically and cognitively by gathering sufficient knowledge and evidence to determine, distinguish, recognize, select, evaluate, and present assumptions. To meet the following criteria, critical thinking in ESD should address the value issues, dilemmas, and challenges of sustainable development.
    1) The ability to question current norms, practices, opinions, and beliefs
    2) The ability to recognize the assumptions underlying our understanding, views, and opinions
    3) The ability to reflect on one's values, perceptions, and actions
4. Integrated problem-solving refers to the ability to use one's knowledge and experiences to solve a problem using a variety of methods. Integrated problem-solving in ESD addresses how a person can apply various skills and innovative solutions to model the learning process and solve the problems and challenges of sustainable development. It must meet the following requirements.

1) The ability to apply different problem-solving frameworks to complex problems
2) The ability to develop and implement innovative solution options
3) The ability to use various processes in learning such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing

5. Collaboration refers to the ability to collaborate as a cross-sector partnership to generate shared values to cooperate with social responsibility. Collaboration in ESD refers to the ability to work collaboratively with others by understanding and respecting others' needs, perspectives, and actions. It enables a person to effectively communicate with others, use interpersonal skills, and deal with conflict in a group setting. It must meet the following requirements.
    1) The ability to participate in the group decisions
    2) The ability to learn from others
    3) The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts

Conditions

1. The issues must be relevant to students' context and can influence the students to think more.
2. Students should have at least basic language function skills or an intermediate level of English proficiency.

UNIT PLAN EXAMPLE

UNIT 4 M-Business

Skill12	**Skills for Leadership and Management (Elective)**	**Subject Area** Social Studies
Grade 12	**Semester** 2 **School Year** 2022	**Duration** 10 weeks (30 hours)
Teacher	Piyawan Sunasuan	
School	Mahidol University International Demonstration School	

Standards and Benchmarks

2. Organization and Managerial Skills
   - 2.1. Student demonstrates self-organization.
     - 2.1.a. Student exhibits effective time management skills
     - 2.1.b. Student prioritizes personal commitments
     - 2.1.c. Student formulates & employs personal goals
   - 2.2. Student plans & implements organized projects.
     - 2.2.a. Student formulates & employs project goals
     - 2.2.b. Student uses sequential project planning steps
     - 2.2.c. Student uses appropriate evaluation tools
   - 2.3. Student demonstrates effective meeting skills.
     - 2.3.a. Student practices a variety of meeting formats
     - 2.3.b. Student demonstrates meeting preparedness
   - 2.4. Student understands the structure of his/her organization
     - 2.4.a. Student demonstrates knowledge of the constitution & by-laws
     - 2.4.b. Student identifies the chain of command in their school
     - 2.4.c. Student understands & executes /her job responsibilities & duties
3. Business Skills
   - 3.1. Student uses effective marketing skills.

3.1.a. Student incorporates merchandising techniques, pricing strategies, and product display.

3.1.b. Student utilizes various advertising techniques.

3.1.c. Student identifies the target population.

3.2. Student understands the financial aspects of student organizations.

3.2.a. Student understands the elements of budgeting.

3.2.b. Student understands appropriate accounting practices.

3.2.c. Student understands the procedure for purchases and expenditures with student funds.

3.2.d. Student understands school, district, state and federal laws affecting student organizations.

3.3. Student incorporates effective customer service techniques.

3.3.a. Student understands chain of command and resolves problems within the scope of their authority.

3.3.b. Student recognizes and applies customer service strategies of handling mistakes, offering assistance, and accepting criticism.

3.3.c. Student employs positive communication skills in customer service.

3.4. Student understands aspects of financial obligations.

3.4.a. Student applies the rules of contracts and bidding.

3.4.b. Student understands rules and regulations affecting student organizations.

ESD skills outcomes

1. Self-Awareness
2. Systems Thinking
3. Critical Thinking
4. Integrated problem-solving
5. Collaboration

Contents

Week 1

- Building a company: company values, vision, mission, capitalization, company name
- Company leadership roles and job applications

Week 2

- Organization of a business
  - Human Resources
  - Public Relations
  - Marketing
  - Finance
  - Production

Week 3-4

- Business plans
- Business meeting skills

Week 5-6

Operational management and sales

Week 7-8

Sales techniques and strategies

Week 9-10

- Writing an annual report
- Business presentation

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Task

Week 1

- Create company values, vision, mission, and company name
- Create a company capitalization plan

Week 2

- Officers election: form departments, review department roles, and responsibilities
- Charter Application
- Begin Stock selling

Week 3

- Set up a board of directors meeting
- Develop a marketing survey
- Complete the cost-benefit analysis of potential products
- Develop a business plan
- Continue selling stock

Week 4

- Complete the product evaluation form
- Select the company product
- Set individual and company sales goals

Week 5

- Approve the business plan
- Implement the plan and begin production
- Create the sales order forms

Week 6

- Implement the plan
- Continue production
- Start selling

Week 7

- Implement the plan
- Continue production and sales
- Discuss challenges and concerns
- Discuss effective sales techniques and strategies
- Create a customer feedback form

Week 8

- Implement the plan
- Continue production and sales
- Analyze the company's performances

Week 9

- Begin wrapping up production
- Create the annual report

Week 10

- Distribute the stockholder dividends including all wages and salary
- Distribute the annual report
- Final presentation

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Assessment and Evaluation

Benchmarks	Assessment Methods	Assessment Tools	Evaluation Criteria	Evaluator
2.1. Student demonstrates self-organization. 2.1.a. Student exhibits effective time management skills 2.1.b. Student prioritizes personal commitments 2.1.c. Student formulates & employs personal goals	Assess the Employment Application form	Employment Application Form	rubrics	Teacher
2.2. Student plans & implements organized projects. 2.2.a. Student formulates & employs project goals 2.2.b. Student uses sequential project planning steps 2.2.c. Student uses appropriate evaluation tools	Assess students' performance	Weekly report	rubrics	Teacher
2.3. Student demonstrates effective meeting skills. 2.3.a. Student practices a variety of meeting formats 2.3.b. Student demonstrates meeting preparedness	Assess attendance record and meeting minutes record	Board of Directors Minutes form	rubrics	Teacher
2.4. Student understands the structure of his/her organization 2.4.a. Student demonstrates knowledge of constitution & by-laws 2.4.b. Student identifies the chain of command in their school 2.4.c. Student understands & executes his/her job responsibilities & duties	Assess company structure design.	Charter Application and Bylaws Form	rubrics	Business Experts
3.1. Student uses effective marketing skills. 3.1.a. Student incorporates merchandising techniques, pricing strategies, and product display. 3.1.b. Student utilizes various advertising techniques. 3.1.c. Student identifies the target population.	Assess the Marketing Business Plan	Marketing Business Plan	rubrics	Teacher

Benchmarks	Assessment Methods	Assessment Tools	Evaluation Criteria	Evaluator
3.2. Student understands the financial aspects of student organizations. 3.2.a. Student understands the elements of budgeting. 3.2.b. Student understands appropriate accounting practices. 3.2.c. Student understands the procedure for purchases and expenditures with student funds. 3.2.d. Student understands school, district, state, and federal laws affecting student	Assess the company capitalization plan	- Human Resources Business Plan - Product Evaluation Form	rubrics	Teacher
3.3. Student incorporates effective customer service techniques. 3.3.a. Student understands chain of command and resolves problems within the scope of their authority. 3.3.b. Student recognizes and applies customer service strategies of handling mistakes, offering assistance, and accepting criticism.	Observe students' sales and collect customers feedback	- Customer Feedback form - Sales Order form	Content Analysis, Rating scales	- Students - Users (Customers)
3.3.c. Student employs positive communication skills in customer service. 3.4. Student understands aspects of financial obligations. 3.4.a. Student applies rules of contracts and bidding. 3.4.b. Student understands rules and regulations affecting student organizations.	Assess students' performance to meet financial obligations	- Business Report Business Presentation	Rubrics	Business Experts
The students empower skills for Education for Sustainable Development	Evaluate 5 ESD skills 1) Self-Awareness 2) Systems Thinking 3) Critical Thinking 4) Integrated problem-solving 5) Collaboration	Skills for ESD evaluation form	Rubrics	- Teacher (Company's performance) - Student (Individual performance)

Skills for ESD evaluation form

	Criteria	5	4	3	2	1
Self-Awareness	a. The ability to be aware of one's needs by reflecting on his/her role in society	The student can evaluate one's needs by reflecting on his/her role in society from many different aspects and extending the ideas to the future need about career.	The student can explain one's needs by reflecting on his/her role in society linking to personal needs on current roles in society.	The student can express one's needs by reflecting on his/her role in society but is not sure if it is relevant to personal needs or not.	The student can inform one's needs by reflecting on his/her role in society if he/ she is prompted or directed.	The student cannot inform one's needs. The need may not be relevant to self and/or show no community awareness.
	b. The ability to create a clear and valuable vision, and plan for the future	The student can create a clear and valuable vision, and plan for the future. The vision deals with a real-world issue. The plan shows a clear framework for the organization.	The student can outline a clear and valuable vision, and plan for the future. The plan is reasonable.	The student can outline a clear and valuable vision, and plan for the future but is not sure how the plan can be done to meet the vision.	The student can create a vision and plan for the future but some are unclear and/ or invaluable. The plan requires the substitution of data to be explained.	The student need help to create a clear and valuable vision, and plan for the future
	c. The ability to move from awareness to knowledge to action.	The student can formulate to move from awareness to knowledge to action even if he/ she is not at school.	The student can move from awareness to knowledge to action when informed.	The student can move from awareness to knowledge to action but is not sure if the steps are correct.	The student can identify the ideas to move from awareness to knowledge to action but cannot show progress in each step.	The student cannot move from awareness to knowledge to action. The student has not yet grasped the idea and/or needs help to start.
	d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes	The student can evaluate and assess the consequences of actions to deal with conflicts and changes; evaluate how well he/ she is working and make the change when necessary.	The student can review the consequences of actions to deal with conflicts and changes; show what the student did and what can be done better.	The student can discuss the consequences of actions to deal with conflicts and changes but is not sure if they were done right or wrong.	The student can identify the consequences of actions to deal with conflicts and changes but cannot explain why something occurred.	The student needs help to evaluate and assess the consequences of actions to deal with conflicts and changes.

	Criteria	5	4	3	2	1
Systems Thinking	a. The ability to recognize and understand relationships in a whole picture	The student can recognize and understand relationships in a whole picture; imagine how the relationships can be changed if something has occurred.	The student can recognize and understand relationships in a whole picture; explain how things are connected.	The student can recognize and understand relationships in a whole picture but describe on simple connection or incorrect comprehension.	The student can identify relationships in a whole picture but relies on simple connections or incorrect comprehension.	The student cannot recognize and understand relationships in the whole picture. The student has not yet grasped the idea and/or needs help to start.
	b. The ability to analyze and synthesize embedded relationships among them	The student has taken the related ideas to analyze and synthesize embedded relationships among them. The analysis shows the clear concepts connected in a hierarchical structure leading to more specific relationships.	The student can analyze and synthesize embedded relationships among them. The analysis shows the concepts connected in a hierarchical structure.	The student can analyze and synthesize embedded relationships among them. The analysis may not always be logical; to a limited hierarchical structure.	The student can analyze and synthesize embedded relationships among them if he/ she is prompted or directed.	The student needs help to analyze and synthesize embedded relationships among them.
Critical Thinking	a. The ability to question current norms, practices, opinions, and beliefs	The student can create questions related to current issues. The question is directly related to a phenomenon that requires a response at higher-order thinking and creates more other critical questions.	The student can outline questions related to current issues. The question is directly related to a phenomenon and requires a response at a higher-order thinking.	The student can discuss questions related to the issues with simple ideas; requires a response at the lower-order thinking.	The student can label questions but irrelevant and not related to the issues. The response to the question is fully described in the case.	The student cannot create a question about the current issues. The student has not yet seen any concerns about the issues.
	b. The ability to recognize the assumptions underlying our understanding, views, and opinions	The student can create the assumptions underlying the various understanding, views, and opinions and can predict the different outcomes if the assumptions are changed.	The student can outline the assumptions underlying the various understanding, views, and opinions; show evidence of a wide understanding of course concepts and experiences	The student can outline the assumptions underlying the understanding, views, and opinions but may not always be logical.	The student can create the assumptions but underlying the understanding, views, and opinions from just one idea.	The student needs help to identify the assumptions underlying the understanding, views, and opinions.
	c. The ability to reflect on one's values, perceptions, and actions	The student can reflect on one's values, perceptions, and actions showing clear evidence of sophisticated ideas from various aspects, and can transfer the ideas to other real-world issues.	The student can explain one's values, perceptions, and actions showing clear evidence of sophisticated ideas from various aspects of values, perceptions, and actions.	The student can discuss one's values, perceptions, and actions but rely on simple ideas that are not connected.	The student can identify one's values, perceptions, and actions but most parts may not be honest or consistent.	The student cannot reflect on one's values, perceptions, and actions. The student ignores some facts about one's values, perceptions, and actions

	Criteria	5	4	3	2	1
Integrated problem-solving	a. The ability to apply different problem-solving frameworks to complex problems	The student can evaluate different problem-solving frameworks for complex problems. The frameworks incorporate various strategies and can be applied to other real-life problems.	The student can apply different problem-solving frameworks to complex problems. The frameworks incorporate various strategies.	The student can apply different problem-solving frameworks to complex problems but with some errors.	The student can apply one problem-solving framework to complex problems. The problems cannot be solved properly and effectively.	The student cannot apply different problem-solving frameworks to complex problems. The student has not yet grasped the idea and/or needs help to start.
	b. The ability to develop and implement innovative solution options	The student can develop and implement innovative solution options. The student can apply the ideas to solve other problems in the real world.	The student can develop and implement innovative solution options. The solutions can be implemented to solve the problems correctly with no issue.	The student can develop and implement innovative solution options but with some errors, and is not sure if they can solve the problems.	The student develops and implements solution options but relies on just one aspect of the idea, maybe simple.	The student cannot develop and implement innovative solution options.
	c. The ability to use various processes in learning such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing	The student can use various processes in learning to solve a problem and can apply the skills to prevent future problems.	The student can use various processes in learning to solve a problem.	The student can use various processes in learning but cannot solve the problem effectively.	The student can use just one process in learning.	The student needs help to use various processes in learning
Collaboration	a. The ability to participate in the group decisions	The student effectively participates in the group decisions; usually leads in the group discussions; provides many good ideas, and inspired others to exchange ideas and make decisions.	The student can participate in the group decisions; offers opinions and ideas; make decisions when asked; can defend the decisions.	The student can participate in the group decisions; offers opinions and ideas; make decisions when asked; can defend the decisions.	The student can participate in the group decisions but cannot share any ideas, and relies on others to make group decisions.	The student seldom/ never participates in the group decisions even is asked.
	b. The ability to learn from others	The student actively searches for ways to learn from others and purposefully; seeks to learn from others; incorporates ideas for self-learning; creates a new learning plan for the future.	The student shows a willingness to learn; listens to others' ideas without interrupting; incorporates ideas to use for self-learning.	The student shows a willingness to learn from others; listens to others' ideas without interrupting.	The student shows limited openness to learning from others and Interrupts others' articulation of their ideas.	The student rarely learns from others; shows no learning attitude at all.
	c. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts	The student can communicate to promote dialogue and negotiation to deal with conflicts; use both verbal and nonverbal communication; take the initial communication to avoid the conflict ahead of time.	The student can communicate to promote dialogue and negotiation to deal with conflicts when occurred while being aware of the whole effects.	The student can communicate to promote dialogue and negotiation to deal with conflicts when occurring step by step, but cannot see the whole effects.	The student occasionally communicates to promote dialogue and negotiation to deal with conflicts; listened mainly; avoids communicating to deal with conflicts.	The student seldom/ never communicates to promote dialogue and negotiation to deal with conflicts. The student has not yet grasped the idea and/or needs help to start.

Evaluation Criteria

Scale Score	Meaning
4.21 – 5.00	Extended Abstract
3.41 – 4.20	Relational
2.61 – 3.40	Multistructural
1.81 – 2.60	Unistructural
1.00 – 1.80	Prestructural

Learning Activities

The teacher designs activities combining the constructivist instructional model using self-directed and issue-based learning which consists of 6 stages. There are 1) Explore the issues 2) Diagnose learning needs 3) Identify objectives 4) Identify the learning task and plan 5) Implement the plan and monitor the process, and 6) Summarize and evaluate the results. The detail is shown as follows.

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Content	Week	Learning Objectives	Learning Activities	Hrs	EDIIIS
- Building a company: company values, vision, mission, capitalization, company name, company Leadership roles, and Job applications	1	2.1. Student demonstrates self-organization. 2.1.a. Student exhibits effective time management skills 2.1.b. Student prioritizes personal commitments 2.1.c. Student formulates & employs personal goals 2.4. Student understands the structure of his/her organization	- The teacher introduces the M-Business project. - The teacher uses the student guidebook to assist students to learn fundamental concepts for building a company and planning to manage time. - Students brainstorm and discuss to explore ideas to create company values, vision, mission, capitalization, and company name. - Students explore company leadership roles.	3	**Stage 1** Explore the issues
Organization of a business - Human Resources - Public Relations - Marketing - Finance - Production	2	2.4.a. Student demonstrates knowledge of constitution & by-laws 2.4.b. Student identifies the chain of command in their school 2.4.c. Student understands & executes his/her job responsibilities & duties	- Students diagnose their needs, abilities, and goals to apply for the desired job position using an employment application form. - The teacher facilitates the officers' election process. - Students set departments, and review department roles and responsibilities to set personal goals for each position. - Students create a company capitalization plan and consider potential products. - Students complete a charter application and bylaws form. - Students begin stock selling.	3	**Stage 2** Diagnose the learning needs
- Business Plans - Business Meeting Skills	3	2.3. Student demonstrates effective meeting skills. 2.3.a. Student practices a variety of meeting formats 2.3.b. Student demonstrates meeting preparedness 3.2. Student understands the financial aspects of student organizations. 3.2.a. Student understands the elements of budgeting. 3.2.b. Student understands appropriate accounting practices. 3.2.c. Student understands the procedure for purchases and expenditures with student funds. 3.2.d. Student understands school, district, state, and federal laws affecting student organizations.	- Students conduct the first meeting to discuss the business objectives, then submit the board of directors' meeting minutes. - Students develop a marketing survey. - Students complete the cost-benefit analysis of potential products. - The teacher motivates students to set goals for each department (conduct a business plan) and the personal goals of each employee. - Students continue selling stock. - The teacher motivates students to set individual and company sales goals.	3	**Stage 3** Identify the learning objectives
	4		- Students complete a human resources business plan. - Students complete a product evaluation form. - Students select the company product.	3	

Content	Week	Learning Objectives	Learning Activities	Hrs	EDIIIS
Operational management and sales	5	2.2. Student plans & implements organized projects. 2.2.a. Student formulates & employs project goals 2.2.b. Student uses sequential project planning steps 2.2.c. Student uses appropriate evaluation tools	- Students approve the business plan: business plan overview, marketing business plan, production business plan, then submit the second board of directors meeting minutes. - Students execute the plan and begin production. - Students create the sales order form to monitor the sales process.	3	**Stage 4** Identify the learning task and plan
	6	3.1. Student uses effective marketing skills. 3.1.a. Student incorporates merchandising techniques, pricing strategies, and product display.	- Students implement the plan/ continue production. - Students start selling.	3	**Stage 5** Implement the plan and monitor the process
Sales techniques and strategies	7	3.1.b. Student utilizes various advertising techniques. 3.1.c. Student identifies the target population. 3.3. Student incorporates effective customer service techniques.	- Students implement the plan/ continue production and sales. - Students create customer feedback surveys to help them monitor and discuss challenges and concerns, effective sales techniques and strategies: marketing, merchandising, advertising, and customer service.	3	
	8	3.3.a. Student understands chain of command and resolves problems within the scope of their authority. 3.3.b. Student recognizes and applies customer service strategies of handling mistakes, offering assistance, and accepting criticism.	- Students implement the plan/ continue production and sales. - Students continue to monitor and discuss challenges and concerns by designing employee surveys. - Students reflect and assess individual and company sales goals.	3	
- Writing an annual report - Business presentation	9	3.3.c. Student employs positive communication skills in customer service.	- Students begin wrapping up production. - Students collect all data and tools to prepare for the final meeting.	3	
	10	3.4. Student understands aspects of financial obligations. 3.4.a. Student applies rules of contracts and bidding. 3.4.b. Student understands rules and regulations affecting student organizations.	- Students conduct the third board of directors' meeting to summarize and evaluate the business performance, then submit the third board of directors meeting minutes. - Students distribute the stockholder dividends including all wages and salary. - Students complete the business report to summarize the performance and productivity outcomes including financial obligations. - Students conduct the final presentation to business experts. - Each student submits an ESD Evaluation form to reflect their learning for meeting learning goals and their learning processes.	3	**Stage 6** Summarize and evaluate the results
			Total	30 Hours	

Learning Materials

1. M-Business Student Guidebook
2. Employment Application Form
3. Charter Application and Bylaws
4. Board of Directors Meeting Minutes
5. Human Resources Business Plan
6. Product Evaluation Form
7. Individual and Company Sales Goals
8. Business Plan Overview Form
9. Marketing Business Plan Form
10. Production Business Plan Form
11. Sales Order Form
12. Customer Feedback Surveys
13. Employee Surveys
14. Business Report
15. Presentation
16. ESD Evaluation form

Learning Resources

1. Textbooks: Farese, L.S.; Kimbrell, G. & Woloszyk, C. (2016). Marketing Essentials. Columbus, OH: Glencoe/McGraw-Hill.
2. Websites: NetTrekker (http://school.nettrekker.com/ Iowa AEA Online (http://www.iowaaeaonline.org/) EasyBib (http://www.easybib.com) Khan Academy (https://www.khanacademy.org/)
3. Example business reports

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SKILLS FOR ESD EVALUATION FORM

Instruction The evaluator marks / in the provided score level to evaluate the skills for ESD of students.

Student ID _____

No.	Criteria	Score level					Evidence
		5	4	3	2	1	
1	Self-Awareness						
1.a.	The ability to be aware of one's needs by reflecting on his/her role in society						
1.b.	The ability to create a clear and valuable vision, and plan for the future						
1.c.	The ability to move from awareness to knowledge to action.						
1.d.	The ability to evaluate and assess the consequences of actions to deal with conflicts and changes						
	Average Score level	/5					
2	Systems Thinking						
2.a.	The ability to recognize and understand relationships in a whole picture						
2.b.	The ability to analyze and synthesize embedded relationships among them						
	Average Score level	/5					
3	Critical Thinking						
3.a.	The ability to question current norms, practices, opinions, and beliefs						
3.b.	The ability to recognize the assumptions underlying our understanding, views, and opinions						
3.c.	The ability to reflect on one's values, perceptions, and actions						
	Average Score level	/5					

No.	Criteria	Score level					Evidence
		5	4	3	2	1	
4	Integrated problem-solving						
4.a.	The ability to apply different problem-solving frameworks to complex problems						
4.b.	The ability to develop and implement innovative solution options						
4.c.	The ability to use various processes in learning such as knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing						
	Average Score level	/5					
5	Collaboration						
5.a.	The ability to participate in the group decisions						
5.b.	The ability to learn from others						
5.c.	The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts						
	Average Score level	/5					
	Total Average Score level	**/5**					

Comment

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Evaluated by_____

Rubrics Skills for ESD evaluation form

	Criteria	5	4	3	2	1
Self-Awareness	e. The ability to be aware of one's needs by reflecting on his/her role in society	The student can evaluate one's needs by reflecting on his/her role in society from many different aspects and extending the ideas to the future need about career.	The student can explain one's needs by reflecting on his/her role in society linking to personal needs on current roles in society.	The student can express one's needs by reflecting on his/her role in society but is not sure if it is relevant to personal needs or not.	The student can inform one's needs by reflecting on his/her role in society if he/ she is prompted or directed.	The student cannot inform one's needs. The need may not be relevant to self and/or show no community awareness.
	f. The ability to create a clear and valuable vision, and plan for the future	The student can create a clear and valuable vision, and plan for the future. The vision deals with a real-world issue. The plan shows a clear framework for the organization.	The student can outline a clear and valuable vision, and plan for the future. The plan is reasonable.	The student can outline a clear and valuable vision, and plan for the future but is not sure how the plan can be done to meet the vision.	The student can create a vision and plan for the future but some are unclear and/ or invaluable. The plan requires the substitution of data to be explained.	The student need help to create a clear and valuable vision, and plan for the future
	g. The ability to move from awareness to knowledge to action.	The student can formulate to move from awareness to knowledge to action even if he/ she is not at school.	The student can move from awareness to knowledge to action when informed.	The student can move from awareness to knowledge to action but is not sure if the steps are correct.	The student can identify the ideas to move from awareness to knowledge to action but cannot show progress in each step.	The student cannot move from awareness to knowledge to action. The student has not yet grasped the idea and/or needs help to start.
	h. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes	The student can evaluate and assess the consequences of actions to deal with conflicts and changes; evaluate how well he/ she is working and make the change when necessary.	The student can review the consequences of actions to deal with conflicts and changes; show what the student did and what can be done better.	The student can discuss the consequences of actions to deal with conflicts and changes but is not sure if they were done right or wrong.	The student can identify the consequences of actions to deal with conflicts and changes but cannot explain why something occurred.	The student needs help to evaluate and assess the consequences of actions to deal with conflicts and changes.

	Criteria	5	4	3	2	1
Systems Thinking	c. The ability to recognize and understand relationships in a whole picture	The student can recognize and understand relationships in a whole picture; imagine how the relationships can be changed if something has occurred.	The student can recognize and understand relationships in a whole picture; explain how things are connected.	The student can recognize and understand relationships in a whole picture but describe on simple connection or incorrect comprehension.	The student can identify relationships in a whole picture but relies on simple connections or incorrect comprehension.	The student cannot recognize and understand relationships in the whole picture. The student has not yet grasped the idea and/or needs help to start.
	d. The ability to analyze and synthesize embedded relationships among them	The student has taken the related ideas to analyze and synthesize embedded relationships among them. The analysis shows the clear concepts connected in a hierarchical structure leading to more specific relationships.	The student can analyze and synthesize embedded relationships among them. The analysis shows the concepts connected in a hierarchical structure.	The student can analyze and synthesize embedded relationships among them. The analysis may not always be logical; to a limited hierarchical structure.	The student can analyze and synthesize embedded relationships among them if he/ she is prompted or directed.	The student needs help to analyze and synthesize embedded relationships among them.
Critical Thinking	d. The ability to question current norms, practices, opinions, and beliefs	The student can create questions related to current issues. The question is directly related to a phenomenon that requires a response at higher-order thinking and creates more other critical questions.	The student can outline questions related to current issues. The question is directly related to a phenomenon and requires a response at a higher-order thinking.	The student can discuss questions related to the issues with simple ideas; requires a response at the lower-order thinking.	The student can label questions but irrelevant and not related to the issues. The response to the question is fully described in the case.	The student cannot create a question about the current issues. The student has not yet seen any concerns about the issues.
	e. The ability to recognize the assumptions underlying our understanding, views, and opinions	The student can create the assumptions underlying the various understanding, views, and opinions and can predict the different outcomes if the assumptions are changed.	The student can outline the assumptions underlying the various understanding, views, and opinions; show evidence of a wide understanding of course concepts and experiences	The student can outline the assumptions underlying the understanding, views, and opinions but may not always be logical.	The student can create the assumptions but underlying the understanding, views, and opinions from just one idea.	The student needs help to identify the assumptions underlying the understanding, views, and opinions.
	f. The ability to reflect on one's values, perceptions, and actions	The student can reflect on one's values, perceptions, and actions showing clear evidence of sophisticated ideas from various aspects, and can transfer the ideas to other real-world issues.	The student can explain one's values, perceptions, and actions showing clear evidence of sophisticated ideas from various aspects of values, perceptions, and actions.	The student can discuss one's values, perceptions, and actions but rely on simple ideas that are not connected.	The student can identify one's values, perceptions, and actions but most parts may not be honest or consistent.	The student cannot reflect on one's values, perceptions, and actions. The student ignores some facts about one's values, perceptions, and actions

	Criteria	5	4	3	2	1
Integrated problem-solving	d. The ability to apply different problem-solving frameworks to complex problems	The student can evaluate different problem-solving frameworks for complex problems. The frameworks incorporate various strategies and can be applied to other real-life problems.	The student can apply different problem-solving frameworks to complex problems. The frameworks incorporate various strategies.	The student can apply different problem-solving frameworks to complex problems but with some errors.	The student can apply just one problem-solving framework to complex problems. The problems cannot be solved properly and effectively.	The student cannot apply different problem-solving frameworks. The student has not yet grasped the idea and/or needs help to start.
	e. The ability to develop and implement innovative solution options	The student can develop and implement innovative solution options. The student can apply the ideas to solve other problems in the real world.	The student can develop and implement innovative solution options. The solutions can solve the problems correctly with no issue.	The student can develop and implement innovative solution options but with some errors, and is not sure if the problems were solved.	The student develops and implements solution options but relies on just one aspect of the idea, maybe simple.	The student cannot develop and implement innovative solution options.
	f. The ability to use various processes in learning.	The student can use various processes in learning to solve a problem and can apply the skills to prevent future problems.	The student can use various processes in learning to solve a problem.	The student can use various processes in learning but cannot solve the problem.	The student can use just one process in learning.	The student needs help to use various processes in learning
Collaboration	d. The ability to participate in the group decisions	The student effectively participates in the group decisions; usually leads in the group discussions; provides many good ideas, and inspired others to exchange ideas and make decisions.	The student can participate in the group decisions; offers opinions and ideas; make decisions when asked; can defend the decisions.	The student can participate in the group decisions; offers opinions and ideas; make decisions when asked; can defend the decisions.	The student can participate in the group decisions but cannot share any ideas, and relies on others to make group decisions.	The student seldom/ never participates in the group decisions even is asked.
	e. The ability to learn from others	The student actively searches for ways to learn from others and purposefully; seeks to learn; incorporates ideas for self-learning; creates a new learning plan for the future.	The student shows a willingness to learn; listens to others' ideas without interrupting; incorporates ideas to use for self-learning.	The student shows a willingness to learn from others; listens to others' ideas without interrupting.	The student shows limited openness to learning from others and Interrupts others' articulation of their ideas.	The student rarely learns from others; shows no learning attitude at all.
	f. The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts	The student can communicate to promote dialogue and negotiation to deal with conflicts; use both verbal and nonverbal communication; take the initial communication to avoid the conflict ahead of time.	The student can communicate to promote dialogue and negotiation to deal with conflicts when occurred while being aware of the whole effects.	The student can communicate to promote dialogue and negotiation to deal with conflicts when occurring step by step, but cannot see the whole effects.	The student occasionally communicates to promote dialogue and negotiation to deal with conflicts; listened mainly; avoids communicating to deal with conflicts.	The student seldom/ never communicates to promote dialogue and negotiation to deal with conflicts. The student has not yet grasped the idea and/or needs help to start.

APPENDIX C

Content Validation Results

Table 41 Content validation results for the student's self-directed learning readiness

Questions		$\bar{x}$	S.D.	Congruence
1	I never have a problem carrying out my study plans.	4.20	0.84	High
2	I don't see any connections between the work I do for my courses and my personal goals/ interests.	4.60	0.55	Very high
3	Free-choose topics for assignments motivate me to learn.	4.60	0.55	Very high
4	When I identified my learning needs, I know how it is important to me and/or others in the community.	4.80	0.45	Very high
5	I frequently do extra work when in a course when I am interested in the topic.	4.80	0.45	Very high
6	I am very confident in my ability to independently prioritize my learning goals.	4.80	0.45	Very high
7	I know where I can find out what I need to know.	4.00	0.71	High
8	I know who I can ask for help.	3.80	0.84	High
9	The primary reason I complete course requirements is to obtain the grade that is expected of me.	4.00	1.00	High
10	I usually do better in courses when the instructor tells me exactly what I need to learn rather than when I choose my topics for learning.	4.60	0.55	Very high
11	I usually struggle in classes if the professor allows me to set my timetable for work completion.	4.60	0.55	Very high

Questions		$\bar{x}$	S.D.	Congruence
12	I would rather take the initiative to learn new things in a course rather than wait for the instructor to foster new learning.	4.20	0.84	High
13	I always depend on the instructor to make sense of things I don't understand.	4.00	0.71	High
14	The pieces of evidence I found on my own usually help me to complete my work with great results.	4.00	0.71	High
15	Teachers or peers sometimes suggest useful pieces of evidence which I can't find on my own.	3.80	0.84	High
16	I feel stressed when I don't know what to do next on my projects.	4.20	0.84	High
17	I feel confident when I see the outcomes which respond to my needs.	4.40	0.89	High

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Table 42 Content validation results for the student's language learning experience in Business studies toward sustainable development

Questions		$\bar{x}$	S.D.	Congruence
1	I use English to participate in social interaction very well.	4.2	0.45	High
2	I can express my thought or feeling in English better very well.	4.2	0.45	High
3	I always ask my friends when I don't understand some words or terminologies.	4.4	0.89	High
4	When a teacher assigns a required research assignment, I always search for information in English first.	4.8	0.45	Very high
5	Searching for information in English helps me to obtain better data than in Thai.	4.2	0.84	High
6	I mostly draft my ideas or plans in English.	5	0.00	Very high
7	I found some struggles in expressing my ideas to a teacher in English in written form.	4.4	0.55	High
8	I think speaking helps me to express more ideas than writing.	4.4	0.89	High
9	I mostly use nonverbal communication to express my ideas when I cannot think of the right words in English.	4.2	0.84	High
10	It is easy to interpret the data I found on secondary data in my own language.	4	1.00	High
11	When I search for the data, I mostly understand the content without asking for help from peers and/or teachers.	4.6	0.55	Very high

12	When there is new terminology, I prefer to use a dictionary to translate it into my native language.	4.4	0.89	High

Table 43 Content validation results for the semi-structured interview questions about the Self-directed learning readiness of Business Studies students and the expectations of Business Studies students' skills

Questions		$\bar{x}$	S.D.	Congruence
1	What are the objectives of having self-directed projects in your class? Why?	4.60	0.89	Very high
2	The opinion toward students' self-directed learning readiness	4.60	0.55	Very high
2.1	How do students take initiative and responsibility in their learning?	5.00	0.00	Very high
2.2	What motivates students to learn and engage with new material?	4.80	0.45	Very high
2.3	How do students develop their self-directed learning while working on a project?	4.60	0.55	Very high
2.4	Does the language barrier hinder them in self-directed learning?	4.40	0.89	High
3	How does self-directed learning empower the student's skills for sustainable development?	4.60	0.55	Very high
4	What are the expectations of Business Studies students' learning skills?	5.00	0.00	Very high
5	How can teachers assist students in developing skills for sustainable development?	4.00	0.71	High

Table 44 Content validation results for the semi-structured interview questions about a constructivist instructional model using self-directed and issue-based learning to empower skills for education for sustainable development in business studies for international high school students in Thailand

Questions		$\bar{x}$	S.D.	Congruence
1	What instructional strategies are most appropriate in terms of objectives (to empower skills for Education for Sustainable Development?) and student characteristics?	4.00	0.00	High
2	What support is needed for successful learning?	4.60	0.49	Very high
3	What conditions should be present to use the constructivist instructional model using Self-Directed and Issue-Based Learning?	4.80	0.40	Very high
4	What level of skills for Education for Sustainable Development do individual students need for accomplishing the objectives? (Including per each skill)	3.80	0.98	High
5	What performances and/ or products will reveal evidence of the skills empowerment?	4.60	0.80	Very high
6	From the research of the constructivist instructional model development, the model has 6 steps as follows: 1) Explore the issues 2) Diagnose learning need 3) Identify objectives 4) Identify the learning task and plan 5) Implement the plan and monitor the process, and 6) Summarize and evaluate the results Please give any further recommendations for implementing these steps to meet the goals.	4.80	0.40	Very high

Table 45 Content validation results for the model and model manual

No.	Issue	$\bar{x}$	S.D.	Congruence
1.	**Name of the model** The constructivist instructional model using self-directed and issue-based learning to empower skills for Education for Sustainable Development in business studies.	4.57	0.49	Very high
2.	**Fundamental concepts of the model development** The background illustrates the basic concepts that have been developed and the focus of the model.	3.71	0.88	High
3.	**Model principle** There are proposed principles that support the theory that can be put into practice.	4.00	0.93	High
4.	**Model objective** There is consistency between objectives and principles. It clearly shows what is expected to happen to learners that are important and necessary for the development of learners in the 21st century.	4.57	0.49	Very high
5.	**EDIIIS processes** They demonstrate complete teaching procedures and clear continuity. It is suitable for teaching and learning. The use of language and wording is clear and easy to understand.	4.43	0.49	High
6.	**Measurement and evaluation** It is consistent with the principle and objectives of the model and is appropriate	4.29	1.03	High
7.	**Conditions** It is consistent with the principle, objectives, and process of learning management of the model.	4.14	0.83	High
8.	**Model Manual** It is appropriate that others can understand and use it.	4.14	0.35	High

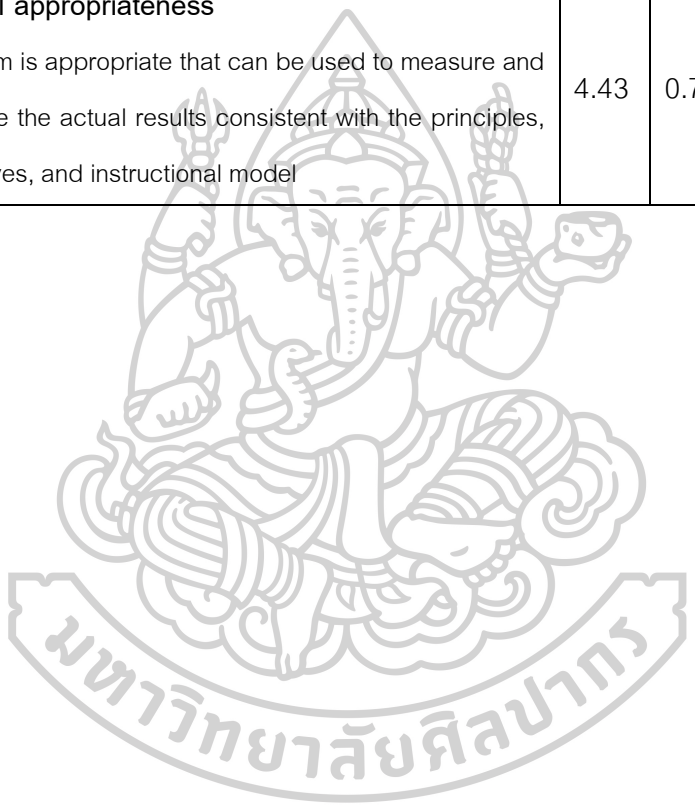
Table 46 Content validation results for the unit plan

No.	Issue	$\bar{x}$	S.D.	Congruence
1.	**Standards and benchmark** It is appropriate and consistent with the learning content and learning management process	5.00	0.00	Very high
2	**Tasks** It is appropriate and consistent with the tasks of learning standards.	4.43	0.49	High
3	**Assessment and Evaluation** It is appropriate and consistent with learning standards and tasks.	4.43	0.49	High
4	**Learning activities** It is appropriate and consistent with the learning management process with learning standards and tasks, which have a clear sequence of steps. It relates to the steps of the constructivist instructional model using self-directed and issue-based learning to empower skills for Education for Sustainable Development in business studies.	4.43	0.49	High
5	**Learning materials and learning resources** It is appropriate and consistent with the learning management process.	4.29	0.70	High

Table 47 Content validation results for the skills for ESD evaluation form

No.	Issue	$\bar{x}$	S.D.	Congruence
1	**Self-awareness** a. The ability to be aware of one's need by reflecting on his/her role in society	4.43	0.49	High
	b. The ability to create a clear and valuable vision, and plan for the future	4.43	0.49	High
	c. The ability to move from awareness to knowledge to action.	4.43	0.49	High
	d. The ability to evaluate and assess the consequences of actions to deal with conflicts and changes	4.43	0.49	High
2	**Systems thinking** a. The ability to recognize and understand relationships in a whole picture	4.57	0.49	Very high
	b. The ability to analyze and synthesize embedded relationships among them	4.57	0.49	Very high
3	**Critical thinking** a. The ability to question current norms, practices, opinions, and beliefs	4.57	0.49	Very high
	b. The ability to recognize the assumptions underlying our understanding, views, and opinions	4.57	0.49	Very high
	c. The ability to reflect on one's values, perceptions, and actions	4.57	0.49	Very high
4	**Integrated problem-solving** a. The ability to apply different problem-solving frameworks to complex problems	4.71	0.45	Very high
	b. The ability to develop and implement innovative solution options	4.71	0.45	Very high
	c. The ability to use various processes in learning	4.71	0.45	Very high

No.	Issue	$\bar{X}$	S.D.	Congruence
5	**Collaboration** The ability to participate in the group decisions	4.57	0.49	Very high
	The ability to learn from others	4.57	0.49	Very high
	The ability to communicate effectively to promote dialogue and negotiation to deal with conflicts	4.57	0.49	Very high
6	**Overall appropriateness** The form is appropriate that can be used to measure and evaluate the actual results consistent with the principles, objectives, and instructional model	4.43	0.73	High



APPENDIX D

Raw Data Collection

Table 48 The data collected from students using the Skills for ESD evaluation form

Leadership Class Section B	Self-Awareness					Systems Thinking			Critical Thinking				Integrated Problem-Solving				Collaboration				Total Average Score level
	1a	1b	1c	1d	Average Score level (Skill)	2a	2b	Average Score level (Skill)	3a	3b	3c	Average Score level (Skill)	4a	4b	4c	Average Score level (Skill)	5a	5b	5c	Average Score level (Skill)	
President	5	4	5	4	4.50	4	5	4.50	5	5	5	5.00	5	5	5	5.00	5	5	5	5.00	4.80
VP Production	5	5	4	5	4.75	5	5	5.00	5	4	5	4.67	5	5	5	5.00	5	5	5	5.00	4.88
staff production	5	4	5	4	4.50	4	3	3.50	4	3	5	4.00	5	4	2	3.67	5	5	5	5.00	4.13
staff production 1	4	3	5	5	4.25	5	5	5.00	5	5	4	4.67	4	4	5	4.33	5	5	5	5.00	4.65
staff production 2	4	3	3	3	3.25	3	3	3.00	4	4	4	4.00	3	4	4	3.67	3	4	4	3.67	3.52
staff production 3	5	4	5	4	4.50	4	4	4.00	4	4	5	4.33	5	4	4	4.33	4	4	4	4.00	4.23
staff production 4	4	3	5	5	4.25	4	4	4.00	5	4	4	4.33	4	4	3	3.67	5	5	5	5.00	4.25
Average score (Department)	4.5	3.67	4.5	4.33	4.25	4.17	4	4.08	4.5	4	4.5	4.33	4.33	4.17	3.83	4.11	4.5	4.67	4.67	4.61	4.28
VP Public Relations	4	4	5	5	4.50	5	4	4.50	5	4	4	4.33	5	4	5	4.67	5	5	5	5.00	4.60
staff public relations 1	2	4	4	4	3.50	4	3	3.50	1	2	4	2.33	4	4	5	4.33	3	4	4	3.67	3.47
staff public relations 2	4	5	2	4	3.75	4	4	4.00	5	4	4	4.33	4	3	5	4.00	5	5	5	5.00	4.22
staff public relations 3	3	3	2	2	2.50	3	3	3.00	3	3	3	3.00	2	2	3	2.33	3	3	3	3.00	2.77
staff public relations 4	5	4	5	5	4.75	5	4	4.50	5	5	4	4.67	5	5	5	5.00	5	4	5	4.67	4.72
Average score (Department)	3.6	4	3.6	4	3.80	4.2	3.6	3.90	3.8	3.6	3.8	3.73	4	3.6	4.6	4.07	4.2	4.2	4.4	4.27	3.95

Leadership Class Section B	Self-Awareness					Systems Thinking			Critical Thinking				Integrated Problem-Solving				Collaboration				Total Average Score level
	1a	1b	1c	1d	Average Score level (Skill)	2a	2b	Average Score level (Skill)	3a	3b	3c	Average Score level (Skill)	4a	4b	4c	Average Score level (Skill)	5a	5b	5c	Average Score level (Skill)	
VP Human Resources	3	5	5	4	4.25	4	4	4.00	5	5	4	4.67	5	4	5	4.67	4	4	4	4.00	4.32
staff human resources 1	5	4	4	5	4.50	4	5	4.50	5	5	4	4.67	5	4	5	4.67	5	5	4	4.67	4.60
staff human resources 2	3	4	4	4	3.75	4	4	4.00	4	5	4	4.33	4	4	5	4.33	3	4	4	3.67	4.02
staff human resources 3	3	5	4	4	4.00	4	4	4.00	5	5	4	4.67	4	4	5	4.33	4	4	4	4.00	4.20
Average score (Department)	3.5	4.5	4.25	4.25	4.13	4	4.25	4.13	4.75	5	4	4.58	4.5	4	5	4.50	4	4.25	4	4.08	4.28
VP Finance	4	4	4	4	4.00	5	4	4.50	4	3	5	4.00	5	2	5	4.00	5	4	5	4.67	4.23
staff finance 1	3	4	4	5	4.00	3	4	3.50	3	3	4	3.33	5	4	5	4.67	5	4	3	4.00	3.90
staff finance 2	4	4	5	3	4.00	5	4	4.50	4	3	5	4.00	5	2	5	4.00	5	5	4	4.67	4.23
Average score (Department)	3.67	4	4.33	4	4.00	4.33	4	4.17	3.67	3	4.67	3.78	5	2.67	5	4.22	5	4.33	4	4.44	4.12
VP Marketing	5	5	5	5	5.00	5	5	5.00	5	4	5	4.67	4	3	5	4.00	5	5	5	5.00	4.73
staff marketing 1	4	4	5	3	4.00	3	5	4.00	4	4	4	4.00	5	4	5	4.67	5	5	4	4.67	4.27
staff marketing 2	5	5	4	5	4.75	4	5	4.50	3	4	3	3.33	4	3	5	4.00	5	5	5	5.00	4.32
staff marketing 3	4	4	5	3	4.00	4	3	3.50	3	3	3	3.00	4	5	5	4.67	5	5	4	4.67	3.97
staff marketing 4	4	2	3	4	3.25	3	3	3.00	3	4	3	3.33	3	3	4	3.33	3	4	4	3.67	3.32
Average score (Department)	4.4	4	4.4	4	4.20	3.8	4.2	4.00	3.6	3.8	3.6	3.67	4	3.6	4.8	4.13	4.6	4.8	4.4	4.60	4.12
Average score by Criteria	4.04	4	4.25	4.13	4.10	4.08	4.04	4.06	4.13	3.96	4.13	4.07	4.33	3.75	4.58	4.22	4.46	4.5	4.38	4.44	4.18
S.D.	0.49	0.70	0.73	0.70	0.45	0.64	0.83	0.69	0.49	0.64	0.49	0.34	0.73	0.45	1.07	0.56	0.73	0.45	0.45	0.53	0.44

APPENDIX E

Research tools

Questionnaires for student's self-directed learning readiness

Research Title: The Development of a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand"

Please read the following statement before completing the questionnaire.

Objectives: This questionnaire aims to gather data on learning preferences and attitudes towards self-directed learning for students in Business Electives in the school year 2021. The data will be collected and analyzed to understand the need for developing an effective instructional model to empower skills for Education for Sustainable Development of the students.

Instruction: The questionnaire consists of 3 parts; Part 1 Demographic data; Part 2 Self-evaluation; Part 3 Additional comments. There is no time limit for the questionnaire. Try not to spend too much time on any one item, however. Your first reaction to the question will usually be the most accurate. Your answers will be collected anonymously and only disclose information for academic benefit. All surveys completed will not be retained in any record, thus the replies will stay secret and will only be used by the researcher for this purpose. The subject may withdraw from participation at any time without penalty or loss of advantages otherwise due to the subject.

If you should have any questions, please do not hesitate to contact the researcher, Piyawan Sunasuan, at (+66) 0873392337 or piyawan.sun@mahidol.edu.

Are you willing to participate in the study?

☐ Yes ☐ No

Part 1 Demographic

Please mark / for each question if the statement applies to you

Gender ☐ Male ☐ Female

Grade Level ☐ 10 ☐ 11 ☐ 12

Business Elective class

**(Select all the Business Studies Classes that you are studying in the current school year)*

☐ Marketing and Advertising
☐ Economics
☐ Entrepreneurship
☐ Business
☐ Skills for Leadership and management
☐ Skills for Life
☐ Finance

Part 2 Self-evaluation

After reviewing each item, please specify how much you believe that statement applies to you. Please carefully read each item and mark / for the response number that best represents your feelings.

No.	Questions	5 Strongly agree	4 Agree	3 Unsure	2 Disagree	1 Strongly Disagree
1	I never have a problem carrying out my study plans.					
2	I don't see any connections between the work I do for my courses and my personal goals/ interests.					
3	The free-choice topic for assignments motivates me to learn.					
4	When I identified my learning needs, I know how it is important to me and/or others in the community.					

No.	Questions	5 Strongly agree	4 Agree	3 Unsure	2 Disagree	1 Strongly Disagree
5	I frequently do extra work when in a course when I am interested in the topic.					
6	I am very confident in my ability to independently prioritize my learning goals.					
7	I know where I can find out what I need to know.					
8	I know who I can ask for help.					
9	The primary reason I work is just to get the expected grade.					
10	I usually do better in courses when the instructor tells me exactly what I need to learn rather than when I choose my topics for learning.					
11	I usually struggle in classes if the professor allows me to set my timetable for work completion.					
12	I would rather take the initiative to learn new things in a course rather than wait for the instructor to foster new learning.					
13	I always depend on the instructor to explain things I don't understand.					
14	The researched data I found on my own usually help me to complete my work with great results.					

No.	Questions	5 Strongly agree	4 Agree	3 Unsure	2 Disagree	1 Strongly Disagree
15	Teachers or peers sometimes suggest useful information/ data which I can't find on my own.					
16	I feel stressed when I don't know what to do next on my projects.					
17	I feel confident when I see the outcomes which respond to my needs.					

Part 3 Additional comments (if any)

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มหาวิทยาลัยศิลปากร

Questionnaires for student's language learning experience in Business studies toward sustainable development

Research Title: The Development of a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand"

Please read the following statement before completing the questionnaire.

Objectives: This questionnaire aims to gather data on Language learning experiences in Business electives students in MUIDS in the school year 2021. The data will be collected and analyzed to understand the need for developing an effective instructional model to empower skills for Education for Sustainable Development of the students.

Instruction: The questionnaire consists of 3 parts; Part 1 Demographic data; Part 2 Self-evaluation; Part 3 Additional comments. There is no time limit for the questionnaire. Try not to spend too much time on any one item, however. Your first reaction to the question will usually be the most accurate. Your answers will be collected anonymously and only disclose information for academic benefit. All surveys completed will not be retained in any record, thus the replies will stay secret and will only be used by the researcher for this purpose. The subject may withdraw from participation at any time without penalty or loss of advantages otherwise due to the subject.

If you should have any questions, please do not hesitate to contact the researcher, Piyawan Sunasuan, at (+66) 0873392337 or piyawan.sun@mahidol.edu.

Are you willing to participate in the study?

☐ Yes ☐ No

Part 1 Demographic

Please mark / for each question if the statement applies to you

Gender ☐ Male ☐ Female

Grade Level ☐ 10 ☐ 11 ☐ 12

Business Elective class

**(Select all the Business Studies Classes that you are studying in the current school year)*

☐ Marketing and Advertising
☐ Economics
☐ Entrepreneurship
☐ Business
☐ Skills for Leadership and management
☐ Skills for Life
☐ Finance

Part 2 Self-evaluation

After reviewing each item, please specify how much you believe that statement applies to you. Please carefully read each item and mark / for the response number that best represents your feelings.

No.	Questions	5 Strongly agree	4 Agree	3 Unsure	2 Disagree	1 Strongly Disagree
1	I use English to participate in social interaction very well.					
2	I can express my thoughts or feelings in English very well.					
3	I always ask my friends when I don't understand some words or terminologies.					
4	When teachers assign a required-research assignment, I always search for information in English first.					

No.	Questions	5 Strongly agree	4 Agree	3 Unsure	2 Disagree	1 Strongly Disagree
5	Searching for information in English helps me to obtain better data than in Thai.					
6	I mostly draft my ideas or plans in English.					
7	I struggle in expressing my ideas to teachers in English in written form.					
8	I think speaking helps me to express better ideas than writing.					
9	I think writing helps me to express better ideas than speaking.					
10	I mostly use nonverbal communication to express my ideas when I cannot think of the right words in English.					
11	It is easy to rewrite the researched data in my native language.					
12	When I search for data, I mostly understand the content without asking for help from peers and/or teachers.					
13	When I encounter new terminology, I usually translate it into my native language to understand the meaning.					

Part 3 Additional comments (if any)

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Semi-structured interview questions about the Self-directed learning readiness of Business Studies students and the expectations of Business Studies students' skills

Research Title: The Development of a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand"

Please read the following statement before completing the questionnaire.

Objectives: This interview aims to gather data on the Self-directed learning readiness of Business Studies students and the expectations of Business Studies students' skills in MUIDS in the school year 2021. The data will be collected and analyzed to understand the need for developing an effective instructional model to empower skills for Education for Sustainable Development of the students.

Instruction

The semi-structured interview consists of 8 questions. The interview should take about 20 minutes. The researcher may ask to make audio recordings of the interview, yet can turn off the recorder at your request. Your answers will be collected anonymously and only disclose information for academic benefit. All surveys completed will not be retained in any record, thus the replies will stay secret and will only be used by the researcher for this purpose. The subject may withdraw from participation at any time without penalty or loss of advantages otherwise due to the subject.

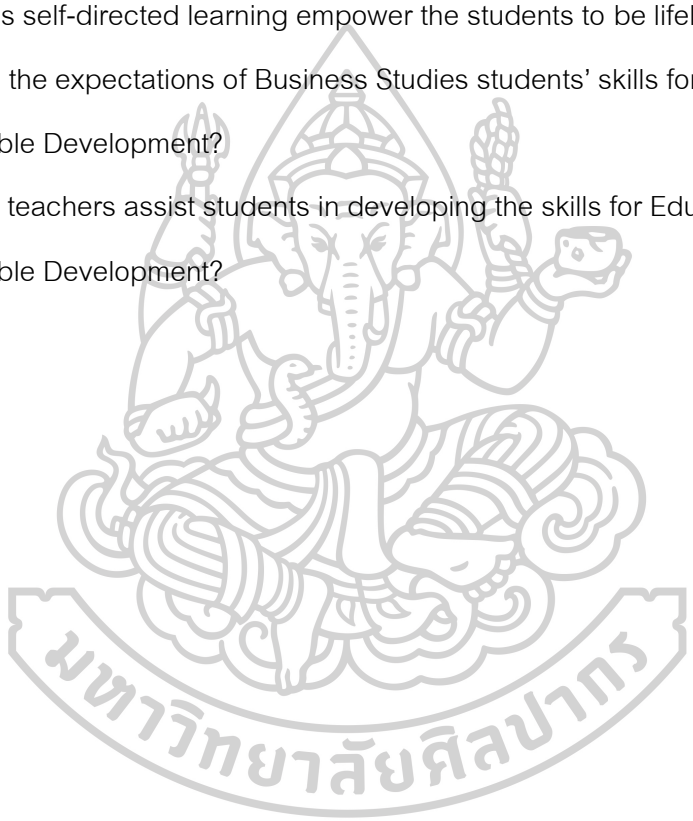
If you should have any questions, please do not hesitate to contact the researcher, Piyawan Sunasuan, at (+66) 0873392337 or piyawan.sun@mahidol.edu.

Are you willing to participate in the study?

☐ Yes ☐ No

Questions

2. What are the objectives of having the self-directed projects in your class? Why?
3. How do students take initiative and responsibility in their learning?
4. What motivates students to learn and engage with new material?
5. How do students develop their self-directed learning while working on a project?
6. What barriers hinder the students in self-directed learning?
7. How does self-directed learning empower the students to be lifelong learners?
8. What are the expectations of Business Studies students' skills for Education for Sustainable Development?
9. How can teachers assist students in developing the skills for Education for Sustainable Development?



Semi-structured interview questions about a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand

Research Title: The Development of a Constructivist Instructional Model using Self-Directed and Issue-Based Learning to Empower Skills for Education for Sustainable Development in Business Studies for International High School Students in Thailand

Please read the following statement before completing the questionnaire.

Objectives: This interview aims to gather data on finding significant inputs and/ or conditions to develop the constructivist instructional model using Self-Directed and Issue-Based Learning. The data will be collected and analyzed to be guidelines for developing an effective instructional model to empower Skills for Education for Sustainable Development in Business Studies for international high school students.

Instruction

The semi-structured interview consists of 6 questions. The interview should take about 20 minutes. The researcher may ask to make audio recordings of the interview, yet can turn off the recorder at your request. Your answers will be collected anonymously and only disclose information for academic benefit. All surveys completed will not be retained in any record, thus the replies will stay secret and will only be used by the researcher for this purpose. The subject may withdraw from participation at any time without penalty or loss of advantages otherwise due to the subject.

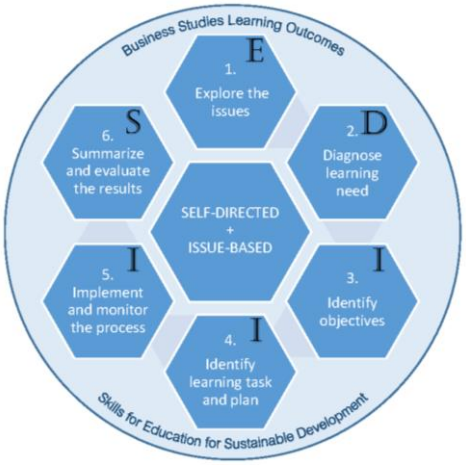
If you should have any questions, please do not hesitate to contact the researcher, Piyawan Sunasuan, at (+66) 0873392337 or piyawan.sun@mahidol.edu.

Are you willing to participate in the study?

☐ Yes ☐ No

Questions

1. What instructional strategies are most appropriate in terms of objectives (to empower skills for Education for Sustainable Development)?
2. What support is needed for self-directed learning and issue-based learning?
3. What conditions should be present to use the constructivist instructional model using Self-Directed and Issue-Based Learning?
4. What level of each skill for Education for Sustainable Development (Self-awareness, Systems thinking, Critical thinking, Integrated problem-solving, and Collaboration) does an individual student need for accomplishing the objectives?
5. What performances and/ or products will reveal evidence of the previously mentioned skills empowerment?
6. From the research of the constructivist instructional model using self-directed and issue-based learning to empower skills for ESD in business studies for international high school students in Thailand, the model has 6 steps as follows.
   1) Explore the issues
   2) Diagnose learning need
   3) Identify objectives
   4) Identify the learning task and plan
   5) Implement the plan and monitor the process
   6) Summarize and evaluate the results



Please give any further recommendations for implementing these steps to meet the goals.

VITA

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