



An Instructional Design for Online Learning in Vocational Education according to a Self-Regulated Learning Framework for Problem Solving during the CoViD-19 Crisis

Thosporn Sangsawang*

Faculty of Technical Education, Rajamangala University of Technology Thanyaburi, Pathumthani 12110, Thailand

Correspondence: E-mail: sthosporn@rmutt.ac.th

ABSTRACT

This study used multimedia games as instruments for critical thinking activities based on the Self-Regulated Learning (SRL) framework for the CoViD-19 crisis, supported by achievement tests and questionnaires. The results showed that the present method is effective to improve students' learning achievement, confirmed by the higher posttest results compared to than those of the pretest. The educational goals of SRL theories were developed through student-directed instructional design online where the students' guide made some input into their learning processes. The students' satisfaction in learning with the SRL framework for the CoViD-19 crisis gained a high level, informing that the SRL framework for problem solving during the CoViD-19 crisis was useful for teaching and career training. Teaching styles (such as the stable focus, orientation, or intent) constituted the entire patterns of teaching behaviors. This study implies that a self-directed learner can be described as being self-managing in a situation where the individual is engaged in student-centered instructions.

© 2020 Tim Pengembang Jurnal UPI

ARTICLE INFO

Article History:

Submitted/Received 26 Apr 2020

First revised 27 May 2020

Accepted 27 Jul 2020

First available online 29 Jul 2020

Publication date 01 Sep 2020

Keywords:

Instructional Design,
Online Learning,
Vocational Education,
Self-Regulated Learning,
CoViD-19 Crisis.

1. THE COVID-19 CRISIS.

The corona virus (CoViD-19) pandemic is shaking the world. This is perhaps the first global health crisis in more than a century. In worldwide, the number of cases of corona

virus has surpassed 2.7 million. The top patients with cattle disease-19 worldwide increased to 2,717,913, the death toll was 190,630, and the number of patients treated was 745,463. World meters website reports

that at 7:15 am on April 24, the number of patients with CoViD-19, the number of patients worldwide has risen to 2,717,913 with 190,630 deaths and 745,463 patients being treated. The United States has still the highest number of 880,204 people infected, with 49,845 deaths. Spain has 213,022 confirmed cases, with 22,157 deaths. In Italy, 189,973 patients have accumulated 25,549 deaths in France. There are a total of 158,183 patients, with a total of 21,856 deaths. There are 153,129 patients in Germany, with 5,575 deaths. In the United Kingdom, There are 138,078 accumulated patients, 18,738 deaths, and 82,804 in China, 4,632 deaths in China (<https://www.bangkokbiznews.com/news/detail/877622>).

The CoViD-19 outbreaks around the world have made millions of workers unemployed. This is because governments have told companies to shut down to curb the spread of the virus. Consequently, many workers are laid off because these companies cannot afford to pay them due to this halt of production (<https://www.bbc.com/worklife/article/20200327-unemployment-during-coronavirus-the-psychology-of-job-loss>).

In addition, CoViD-19 symptoms have even impacted learners with high-achievements. As the participation between learners and teachers might drop off as online learning becomes more of a daily grind for restless teenagers. Teachers need to prepare a virtual classroom for online learning during the current limitations of the CoViD-19 outbreaks.

In worse cases, many students who live in remote areas are often not served very well by educators. The students and their parents have dropped out of touch with schools completely. The coronavirus outbreak of chronic absenteeism was a problem in many schools. The students have had a lack of access to technology due to unavailable phones, Internet access, email,

or any other form of communication as families struggle with the broader economic and health effects. In terms of instructional activities, there are also teachers who cannot teach online due to limited resources and facilities. They cannot control the subjects in the section of theories and the section of practice content. The effect of the coronavirus outbreaks has been enormous. Even before the pandemic, chronic absenteeism was already a problem in many vocational schools, especially those with a lot of low-income students.

The students have had a lack of access to technology. In teaching classes, teachers cannot control the content online, and the students cannot manage their learning, especially for practical lessons. Online learning makes students can go to all web sites that they want to know. Thus, they tend to get lost in the middle of much information.

The vocational students, after vocational students finish they are generally projected to make an income per capita which reaches US\$15,000 in 2035 or up from \$6,900 from in 2017 (<https://www.bangkokpost.com/opinion/opinion/1643672/how-vocational-education-can-build-the-nation>). It has escaped the "middle-income trap", the term that economists use to describe what happens to a country when its growth slows after reaching middle-income levels. The result of productivity in the vocational education sector will upskill, and uplift the economies that have changed Thailand's best labor productivity in the industrial sector, which employs around 8 million workers, followed by the service sector, which employs more than 17 million. The labor of the quality was low- to medium-skilled, 84.3%, for 2017 increased slightly to 85.4%. Meanwhile, the labor of quality was vocational certificates, diplomas increased from 9.5% the workforce 2007 to 11.9% in 2017, which remains a small share of the workforce in

the sector of industry. At the workforce with vocational qualifications in the industrial sector gradually increased, but at a slower rate than this government's expectations. The Thai government has solved the problem by promoting the idea that "vocation creates the nation" under the Eastern Economic Corridor (EEC). The development plan, part of Thailand 4.0, is aimed at revitalizing and enhancing the popular Eastern seaboard development program that has underpinned Thailand's status as an industrial powerhouse for more than three decades. In the EEC development, a framework estimates that the plan needs 173,705 people with vocational qualifications. However, the country is still 55,642 or 32% short of that number.

A study on vocational education in Thailand, undertaken by the Thailand development research institute, found problems in both state and private colleges at which around a million students were pursuing vocational qualifications. The problems revealed were poor quality of applicants, poor quality and inexperienced teachers, out-of-date curriculums that were mostly not competency-based and obsolete equipment (Utakrit, 1999).

In addition, this study stresses the need for diplomas or high vocational level qualifications in subjects with high demand in the market. Vocational education institutions and colleges have to work together with the private sector should subsidize fees and accommodation for 18-year-olds who already have professional certificates and want to study for higher qualifications at the same time as they are working. They would be offered job guarantees with salaries equivalent to those with bachelor's degrees. Institutions should be able to recruit excellent graduates from vocational education colleges nationwide, resulting in a sufficient number of new teachers to replace those who are retiring.

Meanwhile, vocational education teachers should be given chances to enhance their knowledge in all subjects related to the development and Thailand's Industry 4.0. At the same time, all courses should be changed to competency-based curricula by applying the standards issued by the Thailand professional qualifications Institute public organization and the department of skills development to meet the demands of the labor market.

Based on previous studies (Sangsawang *et al.*, 2006a; Sangsawang *et al.*, 2006b; Sangsawang *et al.*, 2006c; Sangsawang *et al.*, 2007; Sangsawang *et al.*, 2011; Sangsawang, 2015) and from background and conditions, problems, and importance mentioned above,

this paper presents an in-depth study on an online design for learning in vocational education according to the Self-Regulated Learning (SRL) framework for any subject, to develop vocational students' abilities in critical thinking, the attitudes of vocational students' abilities toward critical thinking activities. This study was to analyze the current situation using the Delphi technique. Selected experts were asked to express their opinions on what they agreed to create an instructional design online learning in vocational education according to the SRL framework for solving problem CoViD-19 crisis.

2. MATERIALS AND METHODS

2.1. Research subject

The experimental group studied 10 lessons through instructional designs for online learning in vocational education according to the SRL framework for solving problem CoViD-19 crisis.

2.2. Instrument

The instruments were critical thinking activities according to instructional design online learning in vocational education according to SRL framework for solving

problem CoViD-19 crisis; an achievement test; and a questionnaire for students' opinions of the developed critical thinking activities according to the instructional designs for online learning in vocational education according to SRL framework for problem solving during CoViD-19 crisis as following:

Semi-structured interviews used for the first round brainstorming, relating to the framework learning by applying creative thinking and social learning theories (Sangsawang, 2015).

Questionnaire I was used for the second round, in which this is the evaluation of the experts' ideas on learning by applying creative thinking theories and social learning theories, concerning an instructional design for online learning in vocational education according to the SRL framework for problem solving during the COVID-19 crisis, online learning at the vocational level. The questionnaire I was used for evaluating 17 experts on learning by applying creative thinking theories and social learning theories, concerned an instructional design online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis, online learning at the vocational level and used a five-point Likert scale.

After the questionnaires on an instructional design for online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis, were returned, the responses were synthesized and developed through a diagram chart and then categorized into similarities and differences. Questionnaire II used a five-point Likert scale (Likert, 1932).

After the questionnaires on an instructional design for online learning in vocational education developed according to the SRL framework for solving the

The first round of data collection proceeded as follows:

problems of the CoViD-19 crisis, the responses were identified, categorized, and condensed into significant themes and suggestions and sent back to all experts for review and consensus for the fourth round. Questionnaire III was used to check the content validity by 17 experts based on 'yes', 'no, or 'unsure.'

Learners were given a pre-test before learning education media. After that, they did a post-test for a questionnaire to assess students' opinions of the developed education media for an instructional design online learning in vocational education according to the SRL framework for solving the problems of the COVID-19 crisis. Statistical computations for data analysis included the E_1/E_2 , mean, standard deviation, and t-test.

Questionnaires for students' appraisal in the instructional design for online learning in vocational education according to the SRL framework for solving problem CoViD-19 crisis. The instrument for data collection was a questionnaire regarding students' self-appraisal for education media.

2.3. The data collection

The data were collected using the Delphi technique. There were four rounds for the data collection.

2.3.1. First Round: Brainstorming.

The first round involved brainstorming from the experts through semi-structured questionnaires on instructional design for online learning in vocational education according to the SRL framework based on learning by applying creative thinking theories and organization learning theories, all of which focus on cognitive processes, the learning by doing approach, creative thinking, and social context (see Table 1).

17 qualified experts were contacted by phone to request their agreement to participate in the study using the Delphi

technique. When all 17 qualified experts had agreed, this study was supported by issuing official letters of invitation to invite experts.

Appointments were made with all qualified experts on the date and time preferred. Eight experts allowed to meet them in person. The questionnaires were handed to all experts at the appointment. Three experts wrote comments on the questionnaires directly. Five experts gave opinions and the opinions were written into notes. Nine experts preferred to fill out the questionnaires by post, and they returned them. There were no other comments from these experts.

2.3.1.1. *Explanation from experts*

Experts answered questions and explained the purpose of the questionnaires in

instructional design online learning in vocational education according to the SRL framework for solving problem CoViD-19 crisis. The replies were separated into similar and different categories to get general opinion.

The data from the interviews based on the semi-structured questionnaire were grouped and arranged to draft Questionnaire I concerning teaching and learning design based on the three psychology theories, learning by doing theories and creative thinking theories and social learning theories, which focus on cognitive processes, the learning by doing approach, and social context. The data was then analyzed based on Likert's five rating scales.

Table 1. Stages of online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis. As follows:

Step of SRL framework for online learning in vocational education.	The activity of SRL framework for online learning in vocational education.
1. Learning by Doing	<ul style="list-style-type: none"> -Instructors create stimuli to activate receptors, guide how learners respond to questions to enhance encoding, create a level of expectation for learning. -Learners rethink to activate pre-knowledge, Learners find questions, build retrieval and activation of short-term memory, and create retrieval and reinforcement of content as a final evaluation of learning, and retrieval and generalization of learned skills for learners to build new situations, used perform self-regulated learning by doing their tasks. Instructors, share regulating activities to transfer knowledge -Learners and Instructors discuss and construct knowledge organization, combine experiences to develop their self.
2. Creative Thinking	<ul style="list-style-type: none"> -Learners present activity, share activities. -Learners and instructors share thoughts and build their self- knowledge, select perception of content, create semantic encoding for storage of long-term memory, share an understanding of knowledge with instructors, build structures to construct their self- constructionism. -Learners and instructors construct knowledge-building communities, share and construct information to manage knowledge.
3. Social learning Theories	<ul style="list-style-type: none"> -Learners and Instructors construct and collaborate on their tasks, create verification, (Reinforcement and assessment of correct performance).

Data were analyzed using frequency and percentage. The part with five scales was analyzed using mean (M), standard deviation (SD), and its correlation. The levels of agreement from respondents were as follows: an average score of 1.00 - 1.49 means strongly disagree, whereas the average score of 4.50 - 5.00 means agree.

2.3.2. *Second Round: Evaluation of the experts' ideas.*

The second round evaluated the ideas using the Likert five-rating scale in questionnaire II, an instructional design online learning in vocational education according to the SRL framework for solving problem COVID-19 crisis.

17 qualified experts were contacted by phone to request their agreement to participate in the study using the Delphi technique.

Appointments were made with all qualified experts on the date and time the experts preferred. Eight experts allowed to meet them in person. Questionnaire II handed to all experts at the appointment. Three experts wrote comments on the questionnaires directly. Five experts gave opinions and the opinions were written into the notes. Nine experts preferred to fill out the Questionnaire II by post. There were no other comments from these experts.

This study then processed the new data from the first round open-end questionnaire to check for a consensus. The items were selected from the results of the semi-structured interview questionnaire. The results of the synthesis of similarities and differences led to diagrams, "Work well for decision trees," (Strawbridge, 2007) the data collection from 17 experts and were conducted through the post or by interview. He values: median, mode, and interquartile range in each question item were measured.

The data regarding the similarities and the differences based in three psychology theories regarding learning by doing

theories and creative thinking theories and social learning theories; all three theories focus on mental processes, learning by doing approach, the social context synthesized. After that, an instructional model of learning process theories was prepared for instructional design online learning in vocational education according to SRL framework education media using online-offline learning at vocational education.

2.3.3. *Third Round: Re-Evaluation*

In the third round, the 17 experts were required to respond 'yes' or 'no' and 'unsure' to the questionnaire III, an instructional design online learning in vocational education according to the SRL framework.

The results of Questionnaire II. They included all principles, teaching-learning activities strategies, teaching-learning environments, and stages of instructional sequence, which make up mental processes, learning by doing, and social context. The findings were pooled together as similarities or differences. The similarities meant that most of the 17 experts agreed while the differences meant the reverse. The results of the synthesis were used to develop Questionnaire III.

Appointments were made with all qualified experts on the date and time the experts preferred.

Eight experts allowed to meet them in person. Questionnaire III handed to all experts at the appointment. Three experts wrote comments on the questionnaires directly. Five experts gave opinions orally and wrote into notes. Nine experts preferred to fill out questionnaire III by post. There were no other comments from these experts. An instructional model of learning process theories was created for self-regulated online learning in vocational education.

After the study concluded Questionnaire IV, a framework for an instructional model was developed using learning process theories for instructional design online learning in vocational education, according to the SRL framework.

2.3.4. Fourth Round: Solution-Report.

The experts identified all the group's opinions with ideas or strategies and details about the implementation.

2.4. Analysis from Findings and Discussion using Delphi technique

In the first round as the brainstorming session, the study focused on learning by applying creative thinking theories and social learning theories and covering cognitive processes, learning by doing, social context, and the results from this analysis used for the framework for the semi-structured interviews. The questionnaires were sent to 17 experts for about two weeks, and then they were asked to complete and return the first round of questions. After the responses were received, the answers were categorized, synthesized, and developed into another questionnaire I.

In the second round, this study evaluated the experts' ideas phase and consisted of the evaluation of the experts' responses by using a Likert five-rating scale (Likert, 1932, p. 1-55). In round two evaluations, Questionnaire I was used for the management of the experts' ideas on learning by applying creative thinking theories and social learning theories, concerning an instructional design online learning in vocational education according to the SRL framework, online learning at the vocational level.

In the third round as the re-evaluation stage, the selected items from the results of the questionnaire I included all principles, teaching-learning activities/strategies, teaching-learning environments, teaching-learning models learning by applying crea-

tive thinking theories and social learning theories, concerning an instructional design model for instructional design online learning in vocational education according to SRL framework, online learning at the vocational level were pooled together as similarities or differences. The similarities meant that most of the 17 experts agreed, while the differences meant the reverse. The results of the synthesis were used to develop questionnaire II (using a five-point Likert scale), which were sent to the experts for the third round.

In the fourth round, the experts would have been identified, resolved, and reported. All the group's opinions were matched with the ideas or strategies and details of the implementation.

2.5. Brainstorming.

This study conducted semi-structured interviews with 17 experts for the first round: brainstorming of experts' opinions would be related to the framework developed fragmental processes, learning by applying creative thinking theories and social learning theories. The interviews were analyzed with the experts' opinions about each idea.

The detailed interview form was in four parts as follows: key ideas and principles, teaching-learning activities, strategies, instructional environments, and stages of the instructional sequence. The first round of opinions of the experts was synthesized using a Likert five-point rating scale. Following this step, an instructional design online learning in vocational education, according to the SRL framework, prepared to cover learning by applying creative thinking theories and social learning theories.

2.6. Evaluation.

The ideas gained from the experts evaluated using the Likert Scale, a five-point rating scale, questionnaire for the second round, as shown in the evaluation of the 17

experts' ideas on cognitive processes, creative learning, and organization learning concerning an instructional design framework for educational media. The items from the results of the questionnaire were selected. All vital ideas, principles, teaching-learning activities, strategies, instructional environments, and stages of instructional sequence comprising cognitive processes, creative thinking, and organizational learning were pooled together as similarities or differences. The similarities meant that most of the 17 experts agreed while the differences meant the reverse. The results of the synthesis of similarities and differences led it to develop a diagram chart. Then, the 17 experts were required to respond "Yes" or "No" to questionnaire II.

2.7. Re-evaluation.

This study selected the items from the results of questionnaire II. These included all essential ideas and principles, teaching-learning activities, strategies, instructional environments, and stages of instructional sequence comprised of cognitive processes, creating thinking, and organizational learning.

After questionnaire III was concluded, the framework for instructional design online learning in vocational education according to the SRL framework for education media developed. The results of this research focus on three clusters that help create the framework for the theories and also include aspects of the learning process. The study presents the expressions of experts' opinions, and similarities and differences described in the framework.

Re-evaluation found teaching-learning activities and strategies for the education media framework that instructors can apply the results of this research in developing both education media and online media learning or offline media. This study produced an instructional design for online learning in vocational education according

to SRL framework for education media. There were psychological principles used via multimedia, preparing the suitable content for instructional design for education media, learning. Designing the approach for online learning suits learners most and understands the problems arisen from online learning so that learners can integrate ideas, build up the body of knowledge by themselves, and self-appraisal.

Another factor is self-appraisal for instructional design online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis education media.

2.8. The self-appraisal.

In phase I, students' self-appraisal for instructional design online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis education media. To obtain the data concerning students' self-appraisal for education media, the a semi-structured questionnaire was developed regarding student's self-appraisal for education media. The questionnaire focuses on the effectiveness of online learning. The data was collected from the sampling group of 100 Rajamangala University students in the academic year 2014 by using the random sampling method.

The next point is the self-appraisal for the instructional design for online learning for vocational education according to SRL framework for solving problem CoViD-19 crisis from students. In order for online learning to be effective, there must be appropriate materials supporting information resources. Instruction must improve the learner's learning skills. Instructors must update data to students with electronic learning. Education learning on one's own must be convenient and easy for students.

In phase II, online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis as Perceived by Learners. From the responses of the questionnaires regarding instructional design online learning in vocational education according to the SRL framework, it found that 1) Most students look forward to learning new skills. However, Learners would rather have face-to-face interaction and need faculty to remind them of due dates and assignments. Most students can go to university. An online learning course is a personal interest. As of other items, most students need reminding to get things done on time, classroom discussion is sometimes useful to them, they try to follow the directions on their own, then asking for help as needed, and sometimes need help to understand the text.

In phase III, online learning in vocational education according to SRL framework for solving problem CoViD-19 crisis as perceived by Instructors.

This article offered a framework and design process for the education media environment.

The implementation of the internet-based involves several steps, including a consideration of various aspects of information, conceptual development, theories of psychology, and an evaluation of the overall quality of the system environment. In particular, the research aims to improve the design process and usability of the Internet-based environment. The study also confirms that for online learning in vocational education according to the SRL framework for solving the problems of CoViD-19 crisis for education media to be successful, various aspects of the online environment should be considered. These include the application of domain knowledge, conceptual theory, theories of psychology, and an evaluation of the overall quality of the design process.

A further point pertains to online learning in vocational education according to the SRL framework. In this section, the existing instructional design online learning in vocational education (according to SRL framework for education media or called SRL framework that there have got from experts' congruence of selected psychology theories, namely cognitive processes) is based on creative thinking learning and organization learning classified by "Teaching-learning models."

This study created an instructional design framework for educational media. The research involved a framework with the sample for the study consisting of 100 instructors who developed electronic media (such as e-Books, and e-Learning, WBI, and CAI) in the vocational education fields of electrical engineering, electronics, civil engineering, and mechanics from several faculties of technical education in universities in Thailand.

The teaching-learning activities/strategies for the education media framework that it's called SRL framework for solving problem CoViD-19 crisis, there have three parts such as stages of instructional sequence, teaching-learning environments, students' self-appraisal for education media.

3. RESULTS AND DISCUSSION

3.1. Stages of an instructional.

The sequence of online learning in vocational education was undertaken according to SRL framework for solving problem CoViD-19 crisis. These frameworks consist of stages of instructional sequence for teaching and learning 5 steps. The core components are as follows:

- (1) Step 1: Creating conditions. The internal mental learning process as insight information. Instructors provide on operating conditional learning, giving information, signal learning, objectives, expected outcomes, benefit from learning and activities, and create

teaching criteria to suit the learners with external conditions. Chaining: Instructors provide events of learning as well as a step-by-step process of learning. Verbal association: Instructors use a process learning and instruction model. Discrimination: Learners learn through testing and feedback. Concept learning: Instructors create tasks and conditional learning as methods and stages of the learning process for learners.

- (2) Step 2: Creating a processing memory. Learners learn how to achieve the objectives of learning and to meet conditional learning and created rule learning on their own.
- (3) Step 3: Perception of knowledge and Information. Instructors provide programmed instructions, tutorials, simulation, games, and drill as well as practice and test for learners. They were solving the problem by themselves.
- (4) Step 4: Providing situated cognition, teacher-created content, and activities learning. Learners are encouraged to recognize and understand reflective thinking and thinking initiatives. They can be creative thinking.
- (5) Step 5: Performing, processes access. The teacher was designed rills and practices. Learners can plan, set assumptions, investigate, and solve problems by themselves. They should use simulation and gaming media by themselves, self-learning. They were supporting the construction of knowledge. Online learning in vocational education, according to SRL framework for solving problem CoViD-19 crisis in framework Teaching & learning Activities & Strategies Innovation & Attributions.

3.2. Teaching and Learning Activities.

Several parameters are classified by:

- (1) Creating conditions for the internal mental learning process as in insight information. Activities are learning by

doing their self-understanding of the course with learning by doing work.

- (2) Creating processing memory. Creating thinking together with the ability to learn by themselves.
- (3) Perception of knowledge and Information Memory. Sharing knowledge and skills through various types of methods and learning environments.
- (4) Providing situated cognition. Providing situated cognition (Content, activities). Constructing knowledge.
- (5) Performing, processes access. Performing processes access.(Drills Practices).Supporting the construction of knowledge.

3.3. Activity, performance processes access. (Simulation and Games)

Several steps were considered:

- (1) Strategies on innovation and attributions
- (2) Construction of knowledge by social strategies through social context.
- (3) Sharing constructions.
- (4) Discussing constructions.
- (5) Sharing knowledge and skills through various types of methods and learning environments.
- (6) Creating wit and knowledge by themselves.
- (7) Working socially

3.4. Teaching & Learning Activities

The activities are

- (1) Learner's activities/strategies step 1 to step 3; Learners should be activities learning by doing their self-understanding of the course with learning by doing work and creating thinking together with the ability to learn by themselves. In prat, step 5 to step 6, Learner should be sharing knowledge & skills through various types of methods & learning, constructing knowledge, activity, and performance

processes access. Simulation and games).

- (2) The instructor encourages learners cognitive. The teacher should give signals learning, chaining, verbal association, discrimination learning; concept learning; rule learning, problem-solving; creative thinking; reflective thinking; thinking initiatives.
- (3) Learner created thinking by them. The teacher should be encouraged to learner by self-learning-operative learning; Project-based learning Problem-based learning; Situation learning Group Investigation Inquiry method, new knowledge Simulation, and Gaming.
- (4) Instructor and learner should be creating teaching-learning types with organization learning together by learners do brainstorms for project-based, planning their learning; learning by doing; presentation; learning assessment; modifying actions. In terms of strategies on innovation and attributions, the instructor correlated with learners for creating innovation. The core components as follows: Construction of knowledge by social strategies through social context. Finally, there are discussing constructions, sharing knowledge and skills through various types of methods and learning, Creating wit and knowledge by themselves, working socially.

3.5. Teaching-learning environments.

Learning environments according to cognitive processes are learning by doing approach, and social context. The cognitive processes should be using education media, concept map, spider diagram, Fishbone, Structured, T-chart. Creating thinking should be using action, activities, and environments; sharing knowledge and skills through various types of social activities; Activity/ opportunities to develop meta-cognitive knowledge about persons; Tasks;

Strategies to evaluate their learning as part of the total experience. Organization learning should be using interaction with social constructionists, Experiential learning; Perceptions of experience from their understanding; Construction of their thinking of it as "learning- by-making"; Actions they are working socially; Interaction and cognitive processes.

Several steps were done:

- (1) Step I: Activate prior knowledge. Inform expected outcomes of learners; manipulate conditions for inspiring thinking process, and provide learning guidelines. Activate prior knowledge. Self-Discovery Learning (SDL) can help Instructors to The Self-Discovery Learning (SDL) can help learners to Create situations, organization, and knowledge from experience. Construct, store, recall, and use their knowledge when they want—encouraging learners to originate learning. Manage and monitor their learning. They are creating an atmosphere for exchanging opinions. Motivation and volition achieved. Linking learners' ideas motivate themselves to participate in learning and to put their efforts into it. Creating experience of learning new things and learning tasks continuously until they reach their learning goals.
- (2) Step II: Fine question; learning control techniques comprised of the following three steps: search for answers and adapt or change their thinking process, and reflect their thinking by memorizing, analyzing, and application: this second control program control, learner control, and combination control.
- (3) Step III: Judge Discovery; Learning control techniques refer to how learners discover their learning. Step III: Judge Discovery. The SDL maximizes collaboration among learners, peers, and teachers. Components of teaching-

learning management: Operant conditioning includes five steps which are: Learners, Instructors, Stimulates, Respond behaviors, Surroundings, Tools or equipment, Stimulate attention, Activate prior-knowledge, Inform expected outcomes of learners, Manipulate condition for inspiring a thinking process, Provide learning guidelines. Learning control techniques are comprised of the following three steps: Search for answers and adapt or change their thinking process. Reflect their thinking by memorizing, analyzing, and applying. This Second move can be made through three levels of control: (1) program control, (2) learner control: Self-Discovery (SDL)/ combination control.

- (4) Step IV: Transfer knowledge; these techniques include task-based learning, learning contracts, lecture, discussion, self-directed learning, mentorship, small group work, project, collaborative learning, case study, and forum. Transfer knowledge. Transfer knowledge techniques Task-based learning. Develop their specific-knowledge and transfer their competence to a new situation because they learn from real-life situations: Learning contracts, lecture, discussion, self-directed learning, mentorship, small group work, project, collaborative learning, case study, and forum. Offer guidance for learning object design, but methodological tools for testing their efficacy are lacking. Assess their

learning in activities and ensure that it is widely acknowledged. The process of Multimedia Games, according to Constructivism Theory in Using Sign language for Hearing Impaired Children model should be managed, by following these four steps as shown in **Figure 1**. From the course designed for self-online learning, it found that the course began with designing appropriate content following the curriculum and objectives. Learners and instructors have their roles in learning together as well as expressing an opinion, analyzing, and solving problems on their own. The instructor is just a mentor. Learners will achieve success if an instructor provides them with appropriate learning strategies for online learning. Those are: Learning environment under supervision from instructors in online learning following the course objectives, Collaborative learning should be used for online learning, Instructional strategies need tools to design online learning with ease under 10 teaching commandments, which are often used in the classroom and could be used in online learning as well. Ten teaching commandments are: (1) Learning Contracts, (2) Lecture, (3) Discussion, (4) Self-Directed Learning, (5) Mentorship, (6) Small Group Work, (7) Project, (8) Collaborative Learning, (9) Case Study, and (10) Forum. According to instructors' opinions, online learning can be included with instructional strategies.

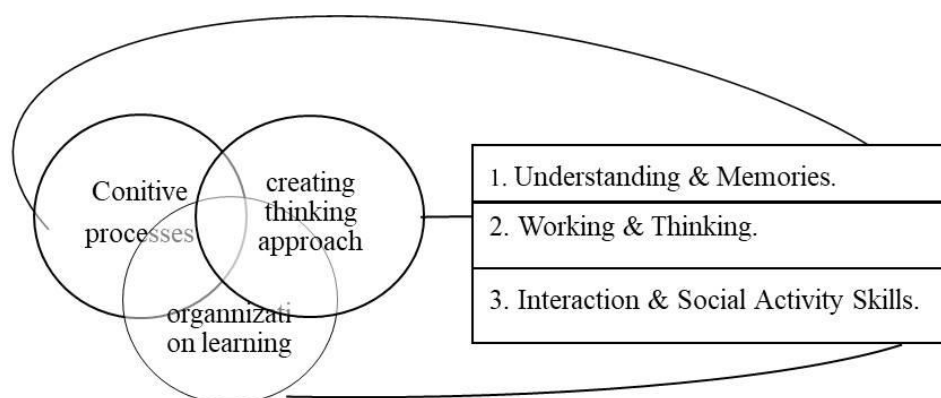


Figure 1. Key ideas and principles (Sangsawang *et al.*, 2006a)

From the results, the discussions could be as follows:

- (1) Most students look forward to learning new skills, but they would rather have face-to-face interaction and need faculty to remind them of due dates and assignments—the probable causes for this finding given by Sankale (2019). There are four significant barriers to students' participation in online activities: Lack of convenient access to technology, and low technological literacy, Students' immaturity and genuine eagerness to learn, Language confidence – poor students are likely to have an extra disadvantage, and Learning style – both individual learning preference and the experience of previous education systems. It is within the capacity of the tutor to affect some of these possible barriers, more than on others.
- (2) Most students can go to campus anytime, and the amount of time they have to work on an online course is less than that for a class on campus; therefore, online learning is a personal interest that could be postponed. Commonly, instructors are the main characters in the classroom. Every learner depends on instructors. However, for online learning, learning resources and information are the centers of this approach so that each learner can search for new knowledge and information regarding the instruction. Without instructors, some learners get lost and do not know what to do. This type of learner called by Annette Vincent and Dianne Ross "perceptive students." They often postpone doing an assignment until the very last minute. The recommendation is to divide a complex project or paper into a series of sub-assignments and providing deadlines for each sub-assignment. The deadlines keep the perceptive students on target. The sub-assignments provide for continuous feedback.
- (3) Most students need reminding to get things done on time. Classroom discussion is sometimes useful to them. They try to follow the directions on their own, and then ask for help as needed, and sometimes need help to understand the text. Learners are satisfied with learning by themselves, but they still need to depend on instructors since they are accustomed to learning with an instructor in the classroom.
- (4) Suggestions from students' self-appraisal for education media were as follows: New technology tips and tricks need to be regularly updated., Lecturers should be available when learners need advice., Due to date for the task required, and learners must be reminded but learning time should not be limited.; Portfolio should be a requirement to track students'

progress.; Discussion should also be held in the class where instructors facilitate each learner in building up his/her own body of knowledge. From students' self-appraisal for online learning, learners would like to be able to apply knowledge in solving problems in daily life. However, some reports had already pointed out the difficulties of online learning in their paper (Hidayat *et al.*, 2020). Their analyses of qualitative data collected revealed that Web-based Pedagogical Tools were highly useful in activating the use of SRL processes necessary to support specific types of learning tasks required for completion of course assignments only. Therefore, course developers and providers offer learners with various kinds of online learning to satisfy the demand and the skills of each learning style.

Therefore, all education media-level, which focused on teaching both theory and practice, instructors create conditional operational learning (Sangsawang, 2015). When learners learn by doing, it leads to self-discovery. All education media might be said to be the teaching of procedural knowledge, in contrast with declarative knowledge, usually used in education in the broader scientific field, and which concentrates on the theoretical and abstract conceptual knowledge which is characteristic of tertiary education.

Vocational education can be taught at the secondary or post-secondary level and can interact with an apprenticeship system, and increasingly it is recognized in terms of prior learning and partial academic achievement (Al-Najar & Hamarneh, 2019). However, it is rarely considered to meet the traditional definition of higher education.

The motivation of the learner is strongly dependent on the learner's confidence in himself or herself. The competence and belief in his or her potential to solve new

problems derived from first-hand experience in the mastery of problems in the past and these are much more powerful than motivation or knowledge obtained from any outside source (Nuthall, 2004). The successful completion of challenging tasks helps learners gain confidence and understanding and achieve learning objectives with effectiveness and efficiency, as well as helping them understand in a faster and more stable way. The learning process, educational institutions, and agencies concerned shall provide training in the thinking process, management, how to face various situations, and application of knowledge for obviating and solving problems (Crane, 2013). That view of learning sees learners as active participants who can construct their understanding of the world around them. Using experience and knowledge, learners can make sense of the new information that they have assimilated. The constructivist theory also asserts that meaningful learning occurs within an authentic situation with authentic learning tasks and that learning facilitated through social interaction, shared thought, and decision making (Fuchs *et al.*, 2000). The system will Thai learners capable of developing themselves and able to compete in the world's knowledge-based economy.

The results reveal that the critical thinking activities, according to SRL framework multimedia games had the efficiency at the 82.00/ 80.83 efficiency criteria. In contrast, the students' learning achievement had a higher posttest than that of the pretest with a significant difference at the 0.05 level. The students' satisfaction in learning with the SRL framework gained an average of 4.47, which was on a high level. There was no treatment for the control group. The pre- and post-tests were analyzed using multiple correlations. Results revealed that there was a relationship between the pre- and post-tests of graphic design with the self-regulated online

learning framework. The self-regulated online learning model in Vocational education in Thailand was useful for teaching graphic design.

4. CONCLUSION

This study has successfully used multimedia games as instruments for critical thinking activities based on the SRL framework for the CoViD-19 crisis, supported by achievement tests and questionnaires. The results showed that the present method is effective to improve students' learning achievement, confirmed by the higher posttest results compared to than those of the pretest. The educational goals of SRL theories were developed through student-directed instructional

design online where the students' guide made some input into their learning processes.

4. ACKNOWLEDGEMENTS

The study was supported by Rajamangala University of Technology Thanyaburi, Thailand. This study acknowledged students and teachers that are collaborated for expertise assistance and technical contributions.

5. AUTHORS' NOTE

Author confirms that there is no conflict of interest regarding the publication of this article. The author confirms that the data and the paper are free of plagiarism.

6. REFERENCES

- Al-Najar, H., & El Hamarneh, B. (2019). The Effect of Education Level on Accepting The Reuse of Treated Effluent in Irrigation. *Indonesian Journal of Science and Technology*, 4(1), 28-38.
- Crane, A. (2013). Modern slavery as a management practice: Exploring the conditions and capabilities for human exploitation. *Academy of Management Review*, 38(1), 49-69.
- Fuchs, L. S., Fuchs, D., Kazdan, S., Karns, K., Calhoun, M. B., Hamlett, C. L., & Hewlett, S. (2000). Effects of workgroup structure and size on student productivity during collaborative work on complex tasks. *The Elementary School Journal*, 100(3), 183-212.
- Hidayat, D. S., Rahmat, C., Fattah, N., Rochyadi, E., Nandiyanto, A., & Maryanti, R. (2020). Understanding Archimedes Law: What the Best Teaching Strategies for Vocational High School Students with Hearing Impairment. *Journal of Technical Education and Training*, 12(1), 229-237.
- <https://www.bangkokbiznews.com/news/detail/877622>, retrieved on April 24, 2020.
- <https://www.bangkokpost.com/opinion/opinion/1643672/how-vocational-education-can-build-the-nation>, retrieved on March 13, 2019
- <https://www.bbc.com/worklife/article/20200327-unemployment-during-coronavirus-the-psychology-of-job-loss>, retrieved on March 28, 2020.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140, 1-55.
- Nuthall, G. (2004). Relating classroom teaching to student learning: A critical analysis of why research has failed to bridge the theory-practice gap. *Harvard educational review*, 74(3), 273-306.

- Sangsawang, T., Jitgarun, K., & Kaittikomol, P. (2006a), Students' self appraisal for online learning, in *Asia Pacific Educational Research Association International Conference*, November 28-30, 2006, The Hong Kong Institute of Education of Hong Kong, SAR China (pp. 1-5).
- Sangsawang, T., Jitgarun, K., & Kaittikomol, P. (2006b). Comparison of selected psychology theories as in Gagné's, constructivism, and constructionism, In *The 4th International Conference on Developing Real-Life Training Experiences: Education Reform through Performance-Based Training*, July 13-14, 2006. KMITL, Bangkok, Thailand (pp. 327- 328).
- Sangsawang, T., Jitgarun, K., & Kaittikomol, P. (2006c). A learning strategy suitable for learners' self-discovery", in *EDU-COM 2006 Engagement and Empowerment: New Opportunities for Growth in Higher Education*, November 22-24, 2006, Nong Khai Campus of Khon Kaen University, Nong Khai, Thailand (pp. 619).
- Sangsawang, T., Jitgarun, K., and Kaittikomol, P. (2007). A synthesis of meaningfulness of training theories as in Gagné's, constructivism, and constructionism towards online training and instructional design, in *The ICAST Asian Symposium 2007 Science Education for all: Towards Sustainable Development Regardless of Resource*, November 6-9, 2007, Pattaya Thailand (pp. 1-11).
- Sangsawang, T., Jitgarun, K., & Kaittikomol, P. (2011). An internet-based instructional design framework for vocational education, *International Journal of Soft Computing*, 6(4), 119-127.
- Sangsawang, T. (2015). Instructional design framework for educational media. *Procedia-Social and Behavioral Sciences*, 176, 65-80.
- Sankale, J. (2019). *Determinants of demand for technical and vocational training among the Youth in Kajiado County, Kenya* (Doctoral dissertation, Jkuat-Cohred).
- Utakrit, S. (1999). The technical-vocational education and training system in Thailand. *International Journal of Sociology*, 29(1), 42-65.