A Development of Constructionism Learning Skills Model for Internship Student Teachers in Thailand

Sirikanya Netrthanon[1],
Sirirat Petsangsri[2],
and Paitoon Pimdee[3]
Faculty of Industrial Education and Technology,
King Mongkut's Institute of Technology Ladkrabang, Thailand
[1]sirikanya.net@gmail.com
[2]sirirat.pe@kmitl.ac.th
[3]paitoon.pi@kmitl.ac.th

Abstract **- This research has an objective to develop the constructionism learning skills model for internship student teachers in Thailand. The researcher has explored the model of teaching process and observing the experimental teaching of the internship student teachers at faculty of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang. The data were collected via 4 steps: 1) observe teaching methods of internship student teachers, 2) analysis and synthesis all of data, 3) interviews facilitators, and 4) focus groups technique gathering by experts in the this field such as constructionism learning theory, learning process, and learning innovation. The results were the new model of constructionism learning skills, it name's the "CDCD Model" consists of 4 stages: 1) learning to Create, 2) learning to Design, 3) learning to Construct, and 4) learning to Develop. This model will plan to use for diffusion to vocational internship student teachers to practice to be professional teachers in the next step.**

Keywords **- Constructionism, Learning Skill Model, Learning Process, Internship Student Teachers**

I. INTRODUCTION

In the age that information is abundant and people can search everything online, information obtained from a single media or one way may not be enough. In particular, the advancement of communication and technology has changed the working style and changed into a new 21st century context. Inspire of technology has replaced workers who perform routine work, while complements workers with higher-level skills and empowers them to be more productive and creative [1] such as team working skill, communication skill, filtering information skill, thinking skill, and information technology skill. Those skills are necessary for this century. Specifically, it is a learning tool which is not limited to the classroom, so information technology and communication skills are essential for all-digital learning [2]. This is the reason that teaching style today needs to be changed.

Once the people skills of the 21st century have been changed in order to match the world and modern society, building people also need to be done with such skills. Nevertheless, the current learning process seems important yet insufficient to live in a 21st century world. Therefore, the teaching style of teachers needs to be changed. Teachers' role is to guide and create activities that go accordingly with the education form and innovation to subdivide according to the characteristics of the students. The teacher is even more important and the need to enhance their study becomes higher [3]. However, the current model of learning management in Thailand is not yet the correct

answer for 21st century social problems. The concrete examples of such results in both national and international test from the National Institute of Educational Testing Service (NIETS) showed that the O-NET test result of the 12th grade students in an academic year 2015 from 8 subjects; Thai, English, social, mathematics, science, health, arts, and home economics average score are less than 50% considered to be very low [4].

Programme for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development: OECD, which tests three subjects; mathematics, science, and reading scores in 2015, found that Thailand's score for all 3 subjects were lower than the average score and Thailand is ranked 55th out of 72 participated countries all over the world [5]. The results of school quality ranking by the Organization for Economic Co-operation and Development: OECD based on mathematics and science scores of 15-year-olds from 76 countries. The result showed that the top 5 on the list are from Asian countries including Singapore, Hong Kong, South Korea, Japan, and Taiwan. Vietnam ranked 12th and Thailand ranked 47th [6]. The analysis of the country's learning ability index by Pearson's World Education Rankings, considered Cognitive Skills and Educational Attainment in 2014 found that Thailand was ranked in the last group and was ranked 35th out of 40 countries for world best education system [7]. These result scores and ranks from institutions mentioned above reflect the worrisome situation of the quality of education in Thailand. They reflect on the current teaching and learning which isn't conducive to students' self-improvement or empowerment for 21st century skills.

Constructionism is a learning theory which most appropriate for learning in this ages. Progressive educators have advocated the use of project-based learning and student-cantered pedagogies [8]. Therefore, the learning ability is one of the most important aspects of education. The ability to learn new things and master them quickly are consider being an advantage [9]. Constructionism focuses on learners' participation, problem solving, working with others or team, providing the opportunity to choose that they interested, having alternative to learn (learn how to learn), and opportunities to learn by taking actions or making things. Teacher's role is to be facilitators, who help learners move through a process together and focuses on how learners participate in the process of learning or planning [10]. The researcher has this idea to develop the constructionism learning management skills for internship student teachers by changing teacher's role to be facilitators. In order to learn this new role, teachers need to work in a team [11].

II. THEORETICAL FRAMEWORKS

The learning management model applied from the constructionism theory, it is a project-based learning that focuses on learning as a team and creating a new product. Constructionism theory was developed by Seymour Papert (1990) since 1960 based on the constructivism theory of Jean Piaget, a Swiss psychologist (1896-1980) who gave importance of students' learning development. Piaget believed students are able to create their own knowledge acting as young experimenting generation who create and test the theory of things all the time when they are given an opportunity to create that knowledge by themselves to understand things in depth, they are eagerly to learn [12].

Therefore, the ideal is to provide opportunities for students to participate in activities to ignite their learning skills. Piaget said "The better learning isn't about finding new ways of teaching for teachers but giving a better learning opportunity for students" [13].

Concept of constructionism theory is learning where students are engaged in producing their own products by providing learning opportunities, choices, and opportunities to learn by doing for themselves. In the linking form where students create products and eventually create new knowledge for further complex creations. The students will act as an active learner in the manner which they are the creators who continuously create product

reflects from their knowledge.

The elements of the constructionism learning process and activities are 3 things; 1) environments, 2) tools and equipment, and 3) teacher's role [14].

First, the environment for students' learning consists of choice for students to choose what their interests, diversity both skilled & styles, and the congeniality that the atmosphere of teaching and learning is pleasant and happy to learn. Second, tools & equipment, the aim of educating is the students to create their own knowledge, and the teachers should have tools and equipment to meet the needs of an individual student and the varieties of tools should be given. Students can choose which are their best performance and help facilitating for students' learning process. Finally, teachers' role, teachers need to understand their roles and accept changing in teaching, it means to encourage and support learning environment, allow students to create their own knowledge, provide useful information, help students to do self-summarize from their results, and practice the students analyze their learning behaviour.

III. RESEARCH METHODOLOGY

The research process is divided into 5 steps:

Step 1: observe teaching methods. The target group is internship student teachers major computer engineering and major electronics engineering, Faculty of industrial education and technology, King Mongkut's Institute of Technology Ladkrabang. We were observed and interview lecturers for more deep information and collected data by themselves. We analyzed data by content analysis method.

Step 2: analyze all of the basic data. This step analyzes and synthesizes basic information from theories, books, and research papers both in Thailand and overseas related to constructionism theory in classroom. There are 50 sources. The purpose is to synthesize the steps of the constructionism. We collected data and analyze all data to obtain the stage of the constructionism learning model.

Step 3: interview facilitators. This step is interviews facilitators who used or apply constructionism theory in their classrooms. The purpose was to disseminate in-depth and detailed of lesson plans. The target group of this study was 7 facilitators there taught in computer, career and technology, art, and science by use and apply constructionism theory with project-based learning in their classes that different contexts by specifying purposive samplings. We used structured interviews with open-ended questions and collected data relate to the process of teaching and learning, learning skills, the role of the facilitators, activities in class, and feedback from learners in each process or activity.

Step 4: develops the prototype model. All data gathered from step 1, 2, and 3 will be synthesized as a prototype of the model. The details of the model will be divided into four areas: learning process, learning activities, learning skills, and measurement and evaluation. This prototype will gives to the experts consideration appropriability in the next step.

Step 5: focus group. This step aims to examine the appropriate quality of the prototype of model that get from step 4. The target audience for this study was 7 experts who expertise in constructionism theory, learning process, learning management skills, and educational technologies derived from the purposive sampling. We collected data and analyzed by content analysis in order to get the constructionism learning skills model.

IV. RESEARCH RESULTS

The results from analyze all data total 50 sources and interview 7 facilitators found that each of the constructionism applied different instructional processes in different ways depends on the concepts, point of views, environment, the students' nature, or in other contexts. According to the synthesis of all data as shown in the table I.

TABLE I
RESULTS FEOM DATA COLLECTION

	Steps	Document	Facilitator	Total
1	Discussion	40	7	47
2	Pedagogy	34	5	39
3	Searching	22	2	24
4	Planning	40	7	47
5	Learning by doing	45	7	52
6	Conclusion	35	2	37
7	Presentation	43	7	50
8	Evaluation	34	2	36
9	Modifying	13	2	15

The results from development on prototype model one of the summary figures in the table has some outstanding and important steps in no matter what context were 7 steps; 1) discussing, 2) pedagogy, 3) planning, 4) learning by doing, 5) concluding, 6) presentation, and 7) evaluation.

Nevertheless, when analyzing the in details of activities from each research or institute, found that steps and goals or methods were similar. The details may vary according to application but the goal or the main concept of the process was the same. Based on the information that has been further analyzed, the researchers summarized the model that consists of five steps: 1) Associate, 2) Pedagogy, 3) Planning, 4) Learning by doing, and 5) Evaluation. This model call "APPLE model" as below.

Fig. 1 APPLE Model

The results from focus group techniques about APPLE Model, experts consider give comments, feedbacks, suggest points in order to improve model. The results as follows:

1. Keywords of Constructionism do not appear in the model.

2. The name in each step difficult to remember or apply.

3. Model suitable only for teachers who had experience in constructionism.

4. Model difficult to applying to teach in traditional school systems.

5. This model may lack sustainability.

In summary, the model should be adapted to fit the context of Thai traditional school system, the process to make it easier to apply and change the name of the procedure for make them easier to remember. Finally, we review the model for simple to apply and easier to remember which combined 3R of Papert, including Re-Think, Re-Do, and Reflection. The results as showing in the figure below.

Fig. 2 The Development of Model

The heart of the constructionism theory is regardless of how the contexts will be changed but the core of the theory remains clear in all of his researches are create / think, design / plan, construct / make, reflection, show & share, and self-assessment / peer assessment. When applying to a new model of constructionism learning management skills model in the form of CDCD model, it consists of 4 steps:

1) learning to **C**reate
2) learning to **D**esign
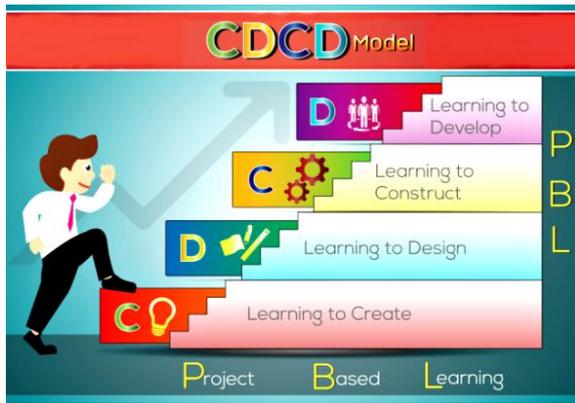3) learning to **C**onstruct
4) learning to **D**evelop

Fig. 3 The CDCD Model

The details of the model such as meaning, keywords, and activities in each step are as shown in the table below.

TABLE II
THE DETAILS OF CDCD MODEL

Stage	Keywords	Activities
Create	- *Interest* - *Think* - *Idea* - *Create* - *Brainstorm* - *Discuss*	1. Set their work piece goal 2. Discuss in group 3. Brainstorm
Design	- *Plan* - *Design* - *Analyze* - *Search*	1. Plan a lesson and create the work piece. 2. Analyze and review background knowledge and knowledge needed to obtain in order to get the work done. 3. Consider the criteria of the assessment to plan the creating of the work which goes accordingly
Construct	- *Construct product* - *Practice* - *Re-check Process*	1. Present the lesson plan. 2. Act according to the plan. 3. Collect knowledge needed for the work piece and make a memo or report. 4. Check the process in constructing own work piece
Develop	- *New knowledge* - *New things* - *Presentation* - *Discussion* - *Reflection* - *Assessment* - *Improve themselves* - *Show & Share*	1. Present new work/ new knowledge/ new things 2. Exchange opinions once the classmate's done with their presentation 3. Evaluate themselves according to the criteria the teacher's given. 4. Speak on the reflecting of the knowledge gained by doing this activity. 5. Think further/ continue thinking/ enhance the ideas from the work piece.

V. DISCUSSION AND CONCLUSION

This research presents the development of the constructionism learning skills model through analyzes and synthesizes several documents and researches, interview facilitators, develops as a prototype model; APPLE model, and focus group technique by 7 experts to considered each step of model in the last step. Finally, we has adjusted the new model; "CDCD model" for developed creative thinking, designing and planning, constructing new thing, and self-development.

In our future work, we will use the CDCD model to design learning activity for teachers. Training should be provided for target group who do not know how to manage learning in class, who do not know how to use the new teaching processes in class, who use the teacher-based learning in class, and especially who are internship student teachers or new teacher in the future. We want to develop teaching and learning, and focusing at develop teachers. We believe if teaching skills of teacher increase, it make another factors will be increase. Consistent with the finding of Sarayuth Sa-ngiam [15] that study about the development of school and quality of the teacher' lives under municipalities in Thailand, he found that when the influence of the school development in teaching and learning factor increasing, the quality of life of the teachers

will be increased. We plan to training teachers to learn new ways of learning management such as for understand how to apply the concept of this model in their classes. Finally, we want to know the result about learning process under model can develop learning skills for teachers or not.

From several research studies led the constructionism theory adapt to learning in different contexts such as Alimisis studied the model of teacher training with constructionism theory and use robot to teach through "TERECoP Project". This program can enhance problem solving skills using IT skills and good relationship between the instructor and learners [16]. In line with Stager's studied that teaches robots using LEGO and MicroWorld programs in children and middle-aged. This method can stimulate their imagination in children and create the power to learn IT in adulthood [17]. There are also studies by Asavasanti that support it. This research studied about constructionism to integrate the knowledge and know how to do in each individual in the group of food engineering experts. It found that each person's learning not different, but the results of learning with each other is very different in organiztion. Constructionism theory can develop learners in many skills such as learning skills, problem solving, think outside the box, ICT literacy, and team working [18]. These credible research results combined with teaching experience on constructionism theory over 10 years, diffusion of this learning management skill through model can improve the learning skills of internship student teachers as well.

REFERENCES

(Arranged in the order of citation in the same fashion as the case of Footnotes.)

[1]   David, A.H., Frank, L., and Richard, M.J. (2003). "The skill content of recent technological change: an empirical exploration". The Quarterly Journal of Economics, Vol. 118(3), p. 1279-1334.

[2]   Vicheanpant, T. (2012). "A creation of innovation diffusion process for diffusing constructionism in traditional schools". Thesis Doctor of Philosophy in Innovative Learning, King Mongkut's University of Technology Thonburi.

[3]   Bellanca, J. and Brandt, R. (2010). "21st century skills: Rethinking how students learn". Bloomington: Solution Tree Press.

[4]   National Institute for Educational Testing Service. (2016). "The average scores of O-Net grade 6 and grade 9 less than half". Bangkok: National Institute for Educational Testing Service, Ministry of Education.

[5]   The Institute for the Promotion of Teaching Science and Technology. (2016). "PISA evaluation result 2015". Bangkok: PISA Thailand, the Institute for the Promotion of Teaching Science and Technology.

[6]   Ministry of Education. (2015). "Singapore champ quality assurance in Asia, Thailand ranked 47th". Bangkok: Ministry of Education.

[7]   Office of the Education Council. (2015). "Pearson's world education ranking 2014". Bangkok: Office of the Education Council.

[8]   Papert, S. (1980). "Mindstorms: children, computers, and powerful ideas". New York: Basic Books.

[9]   Papert, S. (1990). "A critique of techno centrism in thinking about the school of the future". MIT Media Laboratory: Epistemology and Learning Group.

[10]   Rogers, E.M. (1999). "Diffusion of innovation". Prospect Heights, Ill.: Waveland Press.

[11]   Panich, V. (2012). "How to create learning for students in the 21st century". Bangkok: Sodsri - Saritwong Foundation.

[12]   Papert, S. (1990). "A critique of techno centrism in thinking about the school of the future". MIT Media Laboratory: Epistemology and Learning Group.

[13]   Piaget, J. (1964). "Cognitive development in children: Piaget development and learning". Journal of research in science teaching, Vol. 2(3), p. 176-186.

[14] Papert, S. (1990). "A critique of techno centrism in thinking about the school of the future". MIT Media Laboratory: Epistemology and Learning Group.

[15] Sa-ngiam, S. (2017). "The Development of Schools and the Quality of the Teachers' Lives under Municipalities in Thailand". International Journal of the Computer, the Internet and Management, Vol. 25(1), p. 109-114.

[16] Alimisis, D. (2010). "Introducing robotics to teachers and schools: Experiences from the TERECoP Project". Proceedings of the Constructionism 2010 Conference, p. 16-20.

[17] Gary, S.S. (2010). "A Constructionist approach to teaching with robotics". Proceedings of the Constructionism 2010 Conference, p. 22-34.

[18] Suvaluk, A. (2005). "FEPS: A successful story of constructionism learning approach in Thailand". Proceedings of the ICLORD2005 19th International Conference, p. 159-165.