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Effectiveness of Learning Seminar Course to Promoting Research Skills : Observe-Plan-Organize-Present in Science Project

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Abstract: This paper attempted to study the effectiveness of learning approaches between Seminars Course, and Science Project Course in the context of research skill development; Observation, Planning, Organizing, and Presentation skills. Besides, each process of learning could increase the essential research skills, This process required learner's effort to work in group within two semester. The learners received and continued to this CRSS approach the high level of learning achievement in the context of research skills; Observation, Planning, Organizing, and Presentation. Furthermore, the finding of this study could be expressed to the correlative soft skills could be used more than one course, which can be designed others curriculum involved.

Keywords: Seminars Course, Research Skills, Science project

1. Introduction

Science Project's considered as a significant learning approach in every level. Exploring Science, Technology, Engineering, and Science Experiment are common supporting Science Project in High School. There were various definition, Generally, Science Project were defined as an educational activity for students involving experiments or construction of models in one of the science disciplines. Students could present their science project, So it could be called a science fair project. In this present, Science projects were classified into four main types. For instance, Experimental projects, Engineering projects, Display projects, and Theoretical projects.

Science Project development were basically developed by research methodology. For instance, research questions, hypothesis, research design, etc. Which are significant elements of research development inevitably. In addition, soft skill supporting Science project development considered as the other necessary skill called "Research skill". They also be defined as the ability to search for, locate, extract, organize, evaluate, and present information that is relevant to a particular topic. Furthermore, there are various skill promoting research skill such as, Time management, Communication skill, Information gathers.

Research skill are continuously significant for Science Project development. Sanchez, Marcos, Rivero, and Ruiz (2017) founded that learners could develop soft skills during exploring Science Project (Sanchez, Marcos, Rivero, & Ruiz, 2017). According to the Engineering Science Classroom Program, Students were required to study the Seminars Course supposed to train research skills, research methodology in order to preparing student for Science Project development in Grade 11th. Hence, various soft skills in the seminars course were used to create and develop Science Project.

According to the correlation between Seminars course, and Science Project course, authors assumed to study the effectiveness of learning Seminar Course to Promoting Research Skills in Science Project Course by using research skill as the criteria to assess.

2. Related Study

2.1 Seminars Course and Science Project

The Word “Seminar” come from Latin, and it means “seed”. In general, the seminar method encouraged active participants, a group of participants were guided to interact with each other in class. In addition, the seminar defined as the applicable to settings from conferences to other meetings or training. Most of Seminar’s topic are the research seminars. Nevertheless, this course was popularized in the senior high school and undergraduate level to discuss, exchange, and construct knowledge too. The students were provided with the opportunities to present their papers which supported presentation and public-speaking skills. McMullin (2014) also defined that this learning approach often accompanied by a visual presentation and even hands-on (McMullen, 2014). In educational institutions of all levels, there are various objectives. The seminar promoted the basis learning of students. It focused on instruction that was designed for the student to gain specific knowledge within the academic area. In the same time, seminars were an approach for people to increase their educational background through lectures, training, and possible experimentation.

Science Project’s considered as the educational activities supporting experiment or construction of model in one of science discipline. This learning approach continuously popularized over decades. In particular STEM. In addition, the elementary level increasingly taught Science course through science project. Initially, Science project trained and encourage learner the concept of Scientific inquiry. By the way, there were some disruptive physical learning methods after the Covid-19 pandemics, traditional learning were transformed into virtual learning, include laboratory experiment. Science Projects is another fundamental activity creating and constructing knowledge (Jumaat, Dayana, Tasir, & Ashari, 2017). Moreover, Science Project was the other method support self–efficacy in Secondary school in STEM education. Nowadays, Science Project was scoped in the form of Project-based learning. Haatainen, and Aksela (2021) called this approach as “Project-based science learning” (Haatainen, & Aksela, 2021).

According to the definition and significance of Seminar course and Science Project, there are some correlations both in the context of learning methodology. Seminars course initially encouraged learner exchanged knowledge through discussion. Hence the necessary skills are Critical thinking, Communication, and Reading literacy. Similar to science project, learners were encouraged by the intention and hypothesis that curious for various type of phenomenon.

2.2 Research Skills

Research skills defined as the ability to search for extract, organize, evaluate and present information that is relevant to a particular topic. Academic research was a specific type of research. It involved intensive search, investigation, and critical analysis response to a research question or hypothesis. In addition, Mydin, Rahman, and Mohammad (2021) defined as research skills are the ability to find an answer to a question or a solution to a problem (Mydin, Rahman, & Mohammad, 2021). For instance, gathering information, analyzing, and interpreting.

Research skills also considered as a significant in education, it started from observation, learners could create research question, and research topic which’s relevant. Secondly, planning, a skill helped to determine research design. This process comprised of data collection, hypothesis, design experiment, data analysis. Meerah, Osman, Zakaria, Ikhsan, Krish, Lian, and Mahmod (2012) studied the RSD, Research Skill Development framework in

higher education around the development of skills associated with research skills, and interdisciplinary projects (Meerah, Osman, Zakaria, Ikhsan, Krish, Lian, & Mahmod, 2012).

The definition of research skills was defined in various perspectives. In particular, the educational sector. Moreover, somehow, those skills were used to improve and develop teaching, learning method (Attakorn, Tayut, Pisitthawat, & Kanokorn, 2014).

According to the significance of research skills, in particular term of education, they were essential for creating and developing Science project. Similar to Salybekova, Issayev, Abdrassulova, Bostanova, Dairabaev, and Erdenov (2021), Project-based science learning's also considered as an approach consorting Science Project development in every process of Science Project (Salybekova, Issayev, Abdrassulova, Bostanova, Dairabaev, & Erdenov, 2021).

3. Description of Correlation of Research Skills between Seminars and Science Project

3.1 Background and Overall Structure

Research skills was an essential skill, they could encourage learners to get more efficient learning. The research skills consisted of various skills: formulating questions, observing, planning, collecting data, organizing data, and presenting research. Both of courses are the required course in the Engineering Science Classroom, King Mongkut's University of Technology Thonburi for Grade 10th and 11th students. Student could practice the research skills in those programs.

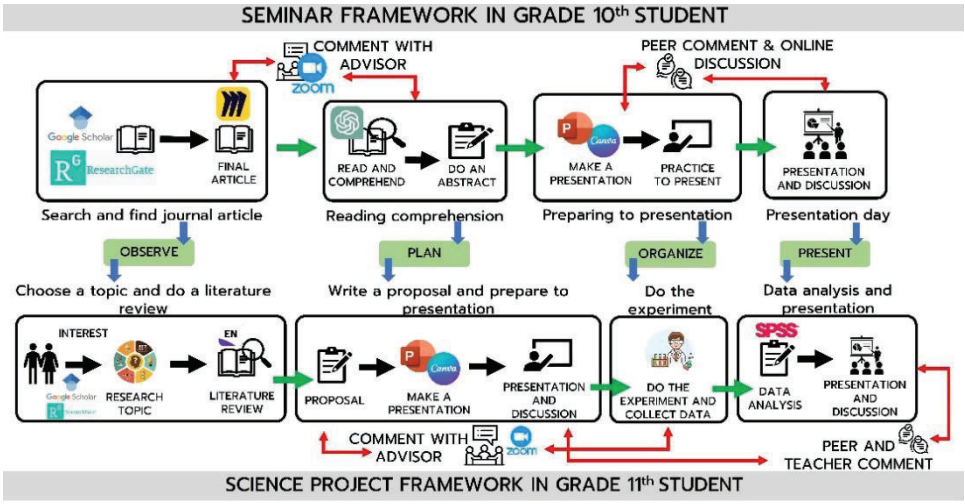

Figure 1. Correlation of Research Skills between Seminars and Science Project (CRSS).

Seminar course is the course for Grade 10th students. This course is provided into three main processes, (Figure 1) the first one is search and find journal article. Then, the learners would read the selected article clearly by discuss with the group members and their advisor both in virtual world, and reality. After that, each group prepared a presentation. In the last process of this course, each group would present the article. According to the learning process, learners were required to develop the skills as follow; observation, planning, organization and presentation that categorized as a part of research skills. Science project course is a course for Grade 11th students. The process consists of four steps. First, choose the research topic and do a literature review. Second, learners wrote a research proposal and make a presentation material. After that, they could start the experiment. In this process the learners were guided by research advisor both in virtual and reality. For the last process, learners analyzed the result, and also made a presentation for the results. Hence, in the end of this course, learners obtained observe skill, planning skill, organize skill and present skills that are significant research skill like the seminar course. (Figure 1)

3.2 Overall of Correlation between Seminars and Science Project Course

From the process of seminar course, the students developed the research skills such as observation skill, planning skill, organize skill as well as presentation skill that encouraged the science project course activity. (Table 1)

Table 1. *The Correlation between Research Skill in Seminar and Science Project Course Activity.*

Research Skill	Seminar Course and Technology supported	Science Project and Technology supported
Observation skill	Learners obtained observation skill through searching an interested journal article and analyzing the credibility of source. In context of Technology-supported, leaners mostly used the credible search engine to find the article. For instance, Google scholar, Research gate, Science direct, etc.	Learners obtained observation skill through research topic's creation process: Finding research topic, doing literature review as well as the article finding in the Seminars course. In context of Technology-supported, leaners also used the search engine to find the credible data source for doing the literature review in this process.
Planning Skill	Learners could develop Planning skill through a groupwork planning. They had to work together in ordered to create their comprehensive abstract. In the context of Technology-supported, learner used various application. For instance, Zoom for consulting with advisor, Chat GPT for writing guideline.	Learners developed Planning skill through same as in the seminars in term of planning the overall project development. According to learning process, leaners also used various application. For instance, Zoom for consulting with research's advisor, Miro, Chat GPT, etc. for making presentation.
Organizing Skill	Learners could gain organizing skill through preparing to present process. It started from presentation making. Leaners had to prepare slide and practice to present so they needed to design and organize whole data in Presentation Slide. In the context of Technology-supported, learners popularized to use Canva for making presentation, and Zoom for virtual consulting with advisor.	The organizing skill obtained from seminar course could support the experiment design, doing experiment as well. They could organize and design the experiment follow by research proposal. According to doing experiment process, learners rarely used a virtual conference except collecting data.
Presentation Skill	Learners could gain presentation skill. In this process, learners had to answer and discuss in class. Hence leaners developed the presentation skills. In the context of Technology-supported, learners rarely used the technology-supported except their own gadgets usage.	Presentation is the last process of learning both in the Seminars, Project course. Learners could develop the presentation skill through answering, discussing in the class. According to those process, learners rarely used the technology-supported except their own gadgets usage.

4. Research Design

4.1 Participant

The participant in this study were 81 Grade 11th students in Engineering Science Classroom, King Mongkut's University of Technology Thonburi. All students passed Seminar course in Grade 10th and Science project course in Grade 11th.

4.2 Procedure

The procedure of CRSS were divided into 2 parts, the first one was beginning with Seminar course (figure 2) that consists of 4 main sections including search and find journal article, reading comprehended and discussion, preparing to presentation. The second section was a Science project course that consists of 4 main sections too, including chose a research topic and do a literature review, write a proposal, and prepare to presentation, do the experiment and data analyze as well as presentation.

Figure 2. The process of Seminar Course and Science Project Course

4.3 Data Collection

The Questionnaire was designed into 4 items that participant gained. For instance, Observation, Planning, Organizing, and Presentation skill variables in ordered to evaluate the effectiveness of each research skill that learner developed from the seminars course which's continue to the Science Project course in Grade 11th.

4.4 Data Analysis

Research skills performance was conducted from 81 students who attended the Seminars Course in Grade 10th , and Science Project Course in Grade 11th. All quantitative data were analyzed using mean and standard deviation. For example of question, According to seminars course learning, Which is the most effective skill that learners develop from?., Which is the most effective skill from the seminars course that learners use in Science Project Course?.

5. Result

5.1 Learning Achievement

The self-evaluation score of learners in the development of research skills; observation, planning, organizing, and presentation skills from seminar course was ranging from 3.47±0.78 to 3.91±0.85 (table 2) and the self-evaluation score of learners in the development of research skills from Science Project Course was ranging from 3.44±0.80 to 3.89±0.75 (table 2).

Table 2. *Self-evaluation in The Development of Research Skill in the Seminars and Science Project*

Research skill	Mean ± SD	
	Seminars Course	Science Project
Observation	3.75±0.82	3.44±0.80
Planning	3.54±0.76	3.89±0.75

Organizing	3.91±0.85	3.78±0.83
Presentation	3.47±0.78	3.55±0.79

5.2 The Correlation between Research skills development from Seminar Course and Science Project Course

This development showed different levels in each dimension (Table 2). The result showed that the participants were able to develop research skills (Observation, Planning, Organizing and Presentation) derived from the Seminar Course to work on the project in Science Project Course (Figure 3).

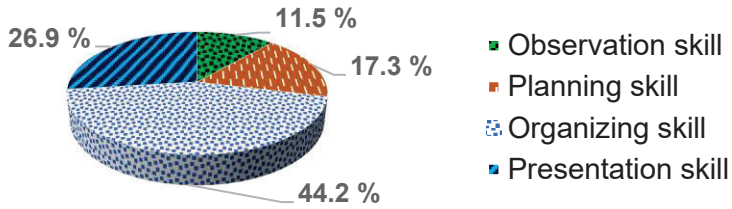

Figure 3. Correlation of Research skills development from Seminars and Science Project

6. Conclusion

In this context, there can be no doubt that the Seminars, and Science Project are significantly develop and improve the research skills in the criteria as follow: Observation, Planning, Organizing, and Presentation. One of the consequences was an increase in the number of students' capabilities acquiring both in an academics, and soft skill supporting research skills. According to the correlation between research skills in the Seminars, and Science Project Course, there are significantly concluded that students derived Planning, and Organizing skills as the most effective skill in both two course. Finally, the development of research skill both in two course can be consort with Meerah, Osman, Zakaria, Ikhsan, Krish, Lian, and Mahmod (2012) , Attakorn, Tayut, Pisitthawat, and Kanokorn (2014) and Salybekova, Issayev, Abdrassulova, Bostanova, Dairabaev, and Erdenov (2021) that Research Skill Development could support interdisciplinary projects, and improved teaching, and learning approaches.

References

Attakorn, Tayut, Pisitthawat & Kanokorn. (2014). Soft Skills of New Teachers in the Secondary Schools of Khon Kaen Secondary Educational Service Area 25, Thailand. *Procedia - Social and Behavioral Sciences*, *112*, 1010–1013.

Sanchez, Marcos, Rivero, Ruiz. (2017). Project Management Training: An Integrative Approach for Strengthening the Soft Skills of Engineering Students. *International Journal of Engineering Education.* Vol.33, pp.1912-1926

Haatainen, O., & Aksela, M. (2021). Project-based learning in integrated science education: Active teachers' perceptions and practices. *LUMAT*, *9*(1), 149–173.

Jumaat, N. F., Tasir, Z., Halim, N. D. A., & Ashari, Z. M. (2017). Project-based learning from constructivism point of view. *Advanced Science Letters*, *23*(8), 7904–7906.

McMullen, V. B. (2014). Using Student-Led Seminars and Conceptual Workshops to Increase Student Participation. College Teaching, 62(2), 62–67.

Meerah, T. S. M., Osman, K., Zakaria, E., Ikhsan, Z. H., Krish, P., Lian, D. K. C., & Mahmod, D. (2012). Developing an Instrument to Measure Research Skills. *Procedia - Social and Behavioral Sciences*, *60*, 630–636.

Mydin, F., Rahman, R. S. A. R. A., & Mohammad, W. M. R. W. (2021). Research Collaboration: Enhancing the Research Skills and SelfConfidence of Early Career Academics. Asian Journal of University Education, 17(3), 142–153.

Salybekova, N., Issayev, G., Abdrassulova, Z., Bostanova, A., Dairabaev, R., & Erdenov, M. (2021). Pupils' research skills development through project-based learning in biology. *Cypriot Journal of Educational Sciences*, *16*(3), 1106–1121.