

## **Learning Strategies for Improving Reflection in Engineering Education in Vietnam**

Nguyen Hung Hoa<sup>1,2</sup>, Ngo Anh Tuan<sup>2</sup>

<sup>1</sup>(Nurse Anesthetist Department, University of Medicine and Pharmacy in Ho Chi Minh City, Vietnam)

<sup>2</sup>(Institute of Technical Education, University of Technology and Education, Vietnam)

Corresponding Author: Nguyen Hung Hoa

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**Abstract:** Reflection was the best competence for students to recognize themselves in learning environment, which helped students apply their knowledge flexibly in different circumstances. In Vietnam, engineering students could understand their knowledge and practice well in the experimental room in university or in the factory of company while they were studying. After graduating, they did not focus on the existed skills in themselves yet and they did not know how to apply the knowledge or skills effectively in the new circumstance. They, therefore, had not been satisfied with the companies' needs yet. The reason was come from that using reflection of students, which was not concerned by teacher, was limitation. This paper showed the problem which was came from that teacher did not spend time to motivate students' learning and to create the open-ended questions for the students. Besides, the problem was come from the students who were not equipped reflective competence for doing experimental and implementing observation while they were learning in university or company. This paper also suggested some learning products and learning tasks for teacher to develop the reflection of students to solve this problem.

**Keywords** Reflection, Reflective Competence, Teaching and Learning of Engineer

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### **I. Introduction**

Educationally, three components were revealed on the pedagogy. They are (1) the knowledge—the facts students knew and concepts students understood; (2) the skills – the ways students used in managing and applying their knowledge, such as computation, experimentation, analysis, synthesis/design, evaluation, communication, leadership, and teamwork; (3) the attitudes – the goals students dictated their skills and knowledge such as personal values, concerns, preferences and biases.

In early years, engineering education performed a decent profession of transmitting knowledge to engineering students. Engineering students developed and sharpened the requisite skills by working through numerous laboratory exercises and industry-designed case studies and by participating in cooperative industrial work-study programs and practice schools. Knowledge was the data base of a professional engineer; skills were the tools used to manipulate the knowledge in order to meet a goal dictated or strongly influenced by the attitudes.

In Vietnam, many projects improved the skills of engineering students by using models which were cooperated between the factories and universities such as the German Duo Model, the students were equipped the knowledge and skills at university and enhanced by practice at factories. The Norwegian model, which the students gained 50% of learning periods at university and 50% of learning periods in the factory, was also applied. To implement these projects successfully, the best current way was improving the engineering students' skills and supporting the students achieve the qualities of factories.

### **II. The Obstacles in Vietnamese Engineering Education**

In Vietnam, imported the foreign labors was increasing dramatically since joining WTO (World Trade Organization). According to Tran (2009), imported labor was increasing day by day, 49.9 % of them with under college level and 46.5% of them with the university level, while only 30% of Vietnamese graduated students was satisfied with the company needs. The students were lack of experience with the real situations. The programs and contents of practicum were not satisfied with the needs of most factories [1]. Vietnamese labors, therefore, were confronting to the unemployment.

In Vietnam, to increase the qualification of the students, the combining project of government, university and company was launched in 2009 [2]. Especially, the university was required to cooperation with company for designing the programs and for building the criteria of the students' practicum. The project's benefits were satisfied with the needs of companies. In university, the students were trained enough knowledge,

skills and attitudes to achieve the criteria of real circumstances in company and sent students to company for practicing. This solution equipped the students get real situation easily. Engineering students, however, were lack of the ability for solving the real problems, the skills for evaluating real situations and the competences for creating the new own knowledge for the company's circumstances. According to Pham (2013), the reason was that students can be learnt how to learn, but the teacher also did not teach them [3]. The teachers did not concern about whether the students understood, which benefits their future careers were, which contexts their knowledge were applied and which difficulties they were confronted. The instructors' role was only as the experts and the coach [4]. Teacher did not spend the time to motivate and create the open-ended questions for the students understand what the students knew, what they did in the new circumstances.

As a result, the active experimentation and reflective observation were not equipped for engineering students. Active experimentation was the skill that used theories to solve problem or make decision while reflective observation was the skill that watched the others with judging by different perspectives [5].

### **III. Roles of Reflection**

The term, reflection, was found in many years ago and in many fields. Precursors of reflective competence found in the Buddhist teachings [6]. John Dewey (1993) recognized for the first time that an individual can reflect on things which are a real problem or a sense of difficulty by merely 'thinking' about them. Reflection was, therefore, an important human activity in which people recaptured, thought and evaluated their experience and it was important to learning [7].

According to Candy (1985), however, students was not taught how to reflect and not provided subsequent guidance to improve reflective competence [8]. The student did not automatically practice or actively engage in reflection. By teaching and guiding learners to develop their reflective competences, educators supported students in developing their capacity to learn and better prepare for lifelong learning [9]. In Vietnam, most students did not know how to reflect on their learning by themselves. The student only focused on finishing the tasks which were given by teacher [10].

Reflection stimulated the students use theories and experience to give the solution for real situation.

According to Morrow, the reflective competence helped students consolidate and reflect on their learning which associated to practices [11]. By this way, the engineering students spent time to reflect on what they knew and how they did before the final decision was presented. Using reflection, students easily found what they needed to enhance in the future learning. Reflection was the important step that made the student recognize the motivation by own themselves.

Using reflective competence, students analyzed new circumstances where new own knowledge was created.

Reflection was an important role for solidify experience in the learner's memory, which raises the potential for further learning. The reflection, therefore, helped the engineering students analyze the happenstances, was in the present situation, which compared the same situation in past. Latterly, the applying knowledge, which was created by the precise combination between the past own experiencer and the own evaluation, used for the present circumstance effectively.

To improve the reflective competence, the open-ended questions were asked, and the student reflected on it instead of citing the facts [12]. The searching the answers for these questions was reflective process [13]. By this way, the students were encouraged to think reflectively and to use questions as a way of developing their own analysis for the experience and present circumstance, which led to deeper learning.

### **IV. Suggested Model for Developing Reflection**

Based on the obstacles Vietnamese Engineering Education, authors suggested the suitable model for improve the reflective ability for Engineering Students (figure 1). The Gibbs's model, which used structured debriefing to facilitate the reflection, involved in Kolb's experiential learning cycle [14].

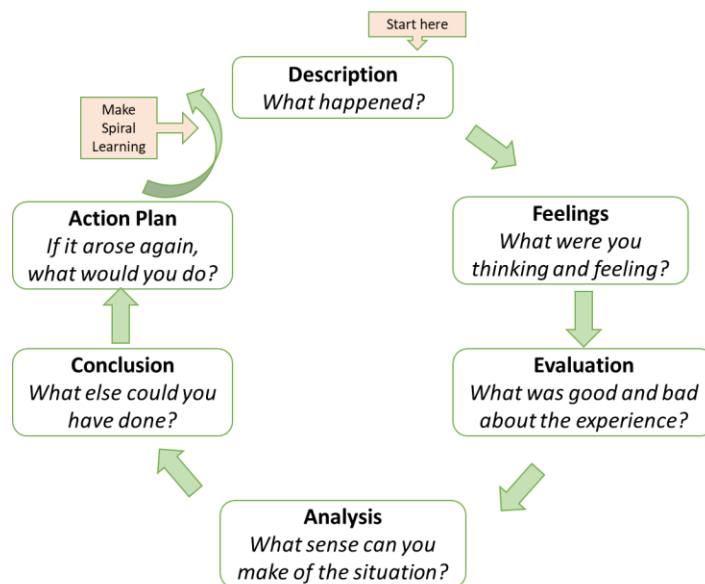


Figure no 1. The Reflection Model

By using this model, the competence of reflection was improved by six-step learning and spiral learning. The description of six-step learning triggered the students’ learning by specifying the details of the situation that occurred according to circumstances because situations will trigger the students’ reflective competence [15]. While details of the situation were delivering, the thinking and feelings of learner, which caused by the impact, were considered. Understanding the problem caused by feeling, the advantages or disadvantages of situation were provided by own learner. To develop the advantage and solve disadvantage, the own experience and new own knowledge were determined for the circumstance. As a result, the learners changed the perspectives while action plan was created for optimizing the present circumstance. After implementing action plan, the recurrence of spiral learning was implemented the circle of six-step learning with different knowledge. To stimulate students’ activity in each step, some learning products and learning tasks were suggested (table 1).

Table no 1. the learning products and learning task to improve reflection

Element Development	Abilities	Learning products can be suggested	Learning tasks can be organized
<b>Description</b>	Specifying the details of the situation that occurs according to circumstances.	List of objects (which have to be determined/ identified); Photo collection; Presentation; Report (of an internship/a project/ an activity); ect.	Make a list/ a table of objects; Create a photo exhibition; Give a presentation; Make a report (of an internship/a project/ an activity); ect.
<b>Feelings</b>	Occuring of thinking; Considering the feelings caused by the impact	List of feeling/ thinking (which have to be determined/ identified); Photo collection; Video/ Clip Presentation; Report (of a feeling/ a thinking / an activity); ect.	Mak a list/ a table of feelings/ thinking; Create a photo exhibition; Create the video/clip Give a presentation; Make a report (of a feeling/ a thinking / an activity); ect.
<b>Evaluation</b>	Assessing of situation as to how it has strength or advantage and weakness or disadvantage	A case study; A discussion/ a debate; A evaluation sheet of product related to content; ect.	Explore/consider a case; Make a discussion/ a debate about topic; Create an evaluation sheet of a product related to learning content; ect.
<b>Analysis</b>	Analyzing the situation that happens from existing knowledge or experience so as to lead to new knowledge arising from learning such situation.	A case study; A discussion/ a debate; Analysis report of technical/ professional product; Scenario for the future; A product related to learning content (e.g a lamp, a souvernir, a plant, a plan, a device, a machine, a toy, a clock, ect.);	Consider a case; Make a discussion/ a debate; Design and analyze a model; Analyze technology and work; Organize a conversation with the experts, politicians, representatives of companies, ect.) ect.

		Presentation about solutions to a problem; ect.	
<b>Conclusion</b>	Concluding from analysis of detailed information on various aspects on the basis of existing experience. This causes new knowledge, resulting in the change of perspectives or ideas that are different.	List of new knowledge/ perspective/ideas (which have to be determined/ identified); Presentation; A evaluation sheet of product related to new situation; A case study; ect.	Mak a list/ a table of new knowledge/ perspective/ideas; Give a presentation; Create an evaluation sheet of a product related to to new situation; Create a case; ect.
<b>Action plan</b>	Planning for practice leads to the change of perspectives, ideas, ability to deal with the problem or situation that similarly occurs appropriately.	Technical products that are manufactured/ assembled/ repaired/ maintained/ upgraded; Experimient; A product related to company's circumstance; ect.	Manufature/ assemble/repair/upgrade a technical product; Carry out a project/ an experiment; Design and produce a product that related to company's circimstance; ect.

Based on the table, the purposes of each step in the six-step learning were presented. Each step, authors also suggested some learning products and learning task for teacher which would be used to help students complete the step in the six-step learning effectively and flexibly according to different situations.

### V. Conclusion

In Vietnam, engineering students were taught the knowledge and practiced skills in the experimental room in university or in the factory of company. After graduating, they did not apply knowledge well in the working place where they ought to get retraining. This paper analyzed this problem and suggested the solution which was reflective competence. Some learning products and learning tasks were recommended to improve reflection of engineering students. This paper was also the base theory for implementing the experimental research in the future to improve the reflective competence for Vietnamese students.

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