APPLYING PROJECT-BASED LEARNING IN TEACHING GENERAL INFORMATICS COURSE TO ENHANCE PROBLEM-SOLVING COMPETENCE FOR STUDENTS AT THAI NGUYEN UNIVERSITY OF AGRICULTURE AND FORESTRY

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ABSTRACT

Problem-solving competence is one of the important and necessary skills in the learning process as well as in practical careers after graduation. There are many methods to train and develop this competence for students, among which project-based learning (PBL) is one of the effective and suitable teaching methods for General Informatics course. The article presents the results of using PBL in teaching the course of General Informatics, providing some qualitative results on the role of applying this method in improving problem-solving competence for first-year students at Thai Nguyen University of Agriculture and Forestry.

Keyword: *Teaching by projects, project-based learning, competence, problem-solving competence, general informatics.*

INTRODUCTION

The current trend of globalization and international integration presents both opportunities and challenges for the development of society in general and education in particular. Human knowledge, skills, and abilities are the determining factors for the development of society. The important task for education is not only to equip students with necessary knowledge, but also to create certain competence for them to adapt to the demands of society when they participate in production or scientific research[1].

To meet the needs of society, education in Vietnam has undergone significant changes. One of the fundamental directions of educational innovation is to move from an academic education system, detached from reality, to an education system that focuses on the formation of action capabilities and the development of learners' proactivity and creativity. To implement this direction, positive teaching methods have been proposed and applied at all levels of education, from primary to university. Project-based learning (PBL) is one of the widely used teaching methods, especially in higher education. This method requires students to perform complex learning tasks, linked to practical issues, combining theory and practice to create specific products. With flexible combination of mental and physical activities, PBL helps students become more proactive in the learning process, enhance problem-solving skills, and other necessary skills.

General Informatics is a mandatory course in the curriculum for students at Thai Nguyen University of Agriculture and Forestry (TUAF). This is a subject with high practical applications and closely related to the daily work of laborers in society. Therefore, applying PBL in teaching General Informatics is suitable and necessary to improve the quality of education and meet the demands of society.

RESULTS AND DISCUSSION

1. Problem-solving competency

There are many studies that have introduced the concept of competency, in which the general education program [2] classifies competency as an activity when considering: "Competency is the mobilization of knowledge, skills, and other personal attributes such as interest, belief, will... to perform a type of work in a specific context." Competencies are divided into many different types, in which problem-solving competency (PSC) is one of the common competencies, serving as the foundation for all human activities in life and work. This is a competency that plays a very important role, demonstrating the ability of individuals (when working alone or in a group) to think about a situation and find solutions to a particular problem. According to [3], the general structure of PSC is described as the combination of four component competencies: Professional competency, methodological competency, social competency, and individual competency (Figure 1).

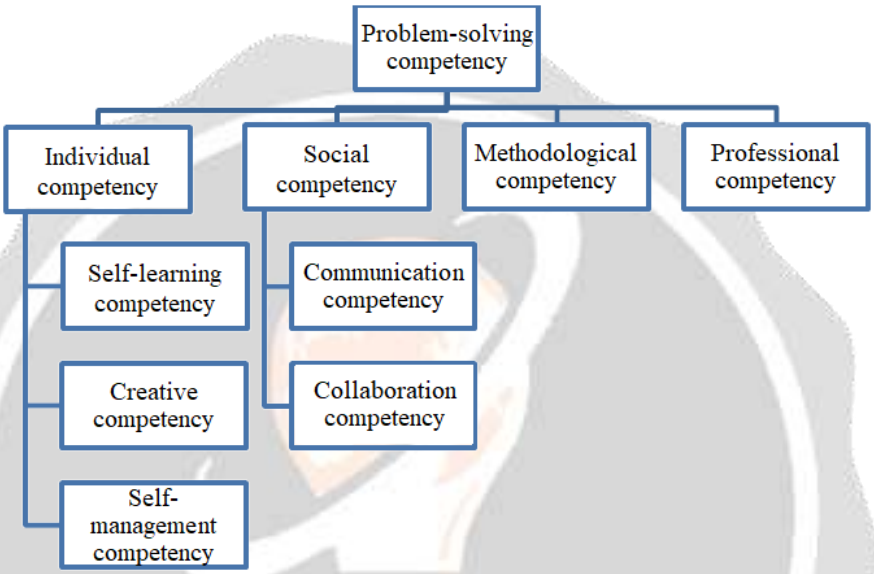

Fig - 1: Structure of problem-solving competence

In the diagram above:

- Self-learning competency refers to the learner's ability to solve a problem on their own, allowing them to acquire new knowledge and skills or reinforce and refine existing ones.
- Creativity competency refers to the ability to create new material or spiritual values, discover new knowledge, and find new solutions, applying one's skills and knowledge in new contexts. Creative thinking is based on an individual's skills and understanding.
- Self-management competency involves awareness of situations that affects one's actions in learning and communication, an understanding of one's rights and obligations, and the ability to self-regulate one's limitations in learning, family and school work, and society.
- Communication competency refers to the ability to use language or body language to clearly and persuasively express thoughts, opinions, and feelings.
- Collaboration competency refers to the ability to work with others towards common goals, with individuals seeking useful results for themselves and the group. The ability to exchange experiences, share knowledge, support and help each other is reflected in the student's ability to collaborate.
- Methodological competency refers to the ability of a person to select and apply learning methods and problem-solving effectively. This includes the ability to analyze, evaluate, and choose the most appropriate method to solve a specific problem or achieve learning objectives.
- Professional compentency is demonstrated by the learner mastering the content of the study materials, and having the ability to self-educate to improve their knowledge and apply it to solve practical problems.

These necessary skills need to be developed and cultivated in students in order to meet the demands of the education and career world after graduation.

2. Project-based learning

Project-based learning (PBL) is a teaching method in which students, under the guidance of a teacher, solve a complex learning task by combining theory and practice, mainly in groups. Groups determine their objectives, plan and execute projects, participate in monitoring progress, and evaluate results. The outcome is a product that can be presented [4].

Therefore, it can be seen that the essence of PBL is a teaching organization method that places the learner at the center. Learners actively acquire knowledge and skills by solving a practical situation-based task. PBL learning activities are designed to closely align with the curriculum and interdisciplinary knowledge to provide opportunities for learners to acquire integrated knowledge and creatively apply it to real-life situations. Through organizing PBL, learners have the opportunity to develop soft skills such as a sense of responsibility, positivity, proactivity, creativity, collaboration, communication, self-learning, self-research, etc.

3. Steps for designing project-based learning to develop problem-solving competency

The project-based learning model for developing problem-solving competency has been implemented and proposed by many authors, such as in studies by [5], [6], [7], [8], etc. Most studies apply this model to teach subjects at the high school level. Based on the results of these studies and the characteristics of teaching at the university level, in this study, we use the following steps for project-based learning:

Table - 1: Project-based teaching steps

Implementation step	Main content
Step 1: Identify the problem, divide the study group	Under the guidance of the teacher, learners will be organized into small groups those are suitable for the project
Step 2: Make a plan.	Each group defines its own goals and implementation plan with the contents that need to be done to complete the project
Step 3: Assign tasks and execute the plan.	From the planning board, the team leader and members discuss the assignment of tasks, the results to be completed at the same time. By planning and assigning tasks, members perform tasks and build products. The product can be a physical item or a report…
Step 4: Report and evaluate project implementation results.	The report is the time when learners demonstrate through presentations and products they design and implement. This is the stage where learners express their own views as well as their ability to evaluate and exchange through their own products and those of other groups. Teachers evaluate learners and the project implementation process through the learners' level of understanding, perception ability, skills, positive attitude, and progress.

4. Application of project-based learning in teaching General Informatics course

4.1. Characteristics of the course

General Informatics is a compulsory foundational course for students of all majors at Thai Nguyen University of Agriculture and Forestry. In addition to meeting the academic requirements like other courses, this course also helps students meet the computer literacy standards of the university. According to the training program framework, General Informatics course is built with 3 credits (1 credit for theory, 2 credits for practice). The content of the subject is divided into 4 chapters, including 3 theoretical chapters: basic knowledge of computer and computer networks, basic computer usage, basic Internet usage and 1 practical chapter on basic applications: Microsoft Word, Microsoft Excel, and Microsoft PowerPoint.

4.2. Implementation process

The project-based learning scenario applied in the General Informatics course is as follows:

Table - 2: Project-based teaching steps in General Informatics

Implementation step	Main content
Step 1: Define the topic and learning objectives	Project name: The impact of the Internet and social networking sites on the lifestyle of today's students. Position: The project is a learning project in Chapter 4 - Basic Internet use, duration: 5 lessons. Duration: 1 week. Objectives to be achieved through the project: Knowledge: Present basic knowledge about the benefits and drawbacks of the Internet and social networks, things to do and avoid when using the Internet and social networks. Skills: Improve presentation skills, teamwork, information collection and processing, use of PowerPoint software to build reports. Attitude: Foster a self-learning mindset, a sense of responsibility for assigned tasks.
Step 2: Implement the project-based learning to complete the product	• Activity 1: Time for completion is 50 minutes in class The teacher divides the students into groups (each group consists of 3 to 5 students), agreeing on how to exchange information and communicate with students The teacher announces the product that students need to submit: a PowerPoint presentation Students listen to the requirements and grading criteria. Students submit the task allocation of each member in the group. • Activity 2: Time for completion is 1 week; presentation time: in the theory lesson of chapter 4 Students research documents, search for information on the internet, and process the data to complete their tasks and submit the report to the group leader. The group discusses and contributes opinions to select the appropriate approach. Complete the content on PowerPoint. Design the content on PowerPoint to be easy to understand and engaging. Preparation for content presentation
Step 3: Report the results of the learning project	During the class process, the teacher presents issues that may directly or indirectly relate to the results of the learning project of each group and calls upon a representative of the group to present their group's viewpoint. The groups comment, discuss and criticize the content of the presentation. At the end of the group's presentation, the teacher evaluates and identifies the knowledge that needs to be remembered.
Step 4: Evaluation of learning project outcomes	General evaluation of groups as well as individual students who have completed the tasks of the learning project through the following contents: • Regarding the product: Is the layout of the presentation complete and reasonable? Are the contents of the slides accurate and relevant to the topic? Are the slides using effects to make them engaging for the audience? • Evaluation of the level of understanding, cognitive ability, and autonomy of students through their performance in the presentation and answering questions from classmates.

The above process has been initially tested by the author with two groups of students in the K54 course at the university. The qualitative results with classes that used project-based learning for the content of Basic Internet Usage showed that students were enthusiastic in discussions, actively and proactively worked in groups. The implementation ideas of each group were creative and produced high-quality products. The presentation skills, teamwork, and product evaluation of the students had significant improvements.

In addition to the achieved results, we also acknowledge that the project-based learning method requires a significant amount of time and is not suitable for abstract content. Therefore, teachers need to base on the program length and the learning outcomes of the course to select appropriate content for application.

4.3. Some notes when implementing

To achieve high effectiveness when applying the proposed process, teachers need to pay attention to the following issues:

- Firstly, the project proposed must be closely related to real-life issues. The problem in the project must be familiar to students and attract their attention to create interest and motivation for learning.
- Secondly, students must play an active role in the project implementation process. After the project is proposed, teachers should empower students in proposing and developing ideas, planning implementation. This helps students to best utilize their abilities through a suitable implementation plan.
- Thirdly, teachers need to have a detailed and specific evaluation plan and ensure fairness in the group work process. In addition, teachers need timely guidance and directions to ensure that the students' implementation process achieves the best results.

CONCLUSIONS

Teaching through projects is a suitable teaching method for the General Informatics course for students at Thai Nguyen University of Agriculture and Forestry. Through this teaching method, not only do students actively acquire knowledge, but they also develop and enhance the necessary skills and abilities.

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