

# Determination of problem-solving competency framework associated with student's majors

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**Abstract.** Based on analysis and evaluation of opinions of experts in Physics teaching theory and methods and likert survey data uses a 5-point scale, the article has built to the structure of a problem-solving competency framework associated with students' majors consisting of 4 elements of competency, 11 behavioral indicate, 33 quality criteria of behavior. This competency framework provides problem-solving steps and activities in different training areas, helping lecturers research and implement teaching to develop students' problem-solving competency associated with their majors. And at the same time is the basis for designing the scale and the corresponding competency assessment tool.

## 1 Introduction

To meet the labor market needs of the 21st century, educational institutions need to equip students with the knowledge and skills to be ready to work after graduation. One of the necessary competencies recognized by many authors and organizations is problem-solving. Many authors and educational institutions have researched and applied the general problem-solving steps in different fields with different purposes [1],[2],[3]... However, currently, there is no research that fully and in detail on the problem-solving competency framework for students, especially the problems associated with the major. Therefore, determining the problem-solving competency framework associated with the student's majors is the primary purpose of the research.

## 2 Method

The article used qualitative methodology to build a problem-solving competency framework associated with the student's majors with 6-steps process as follows (Figure 1):

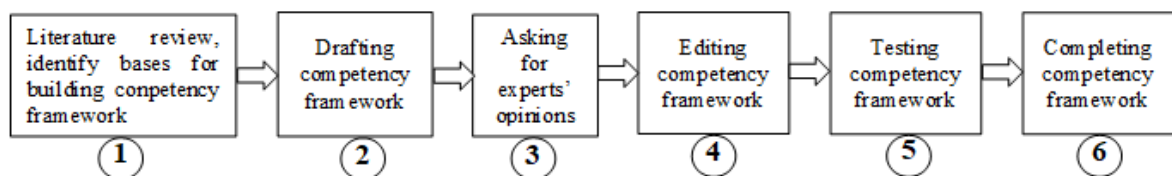


Figure 1: Process of building a problem-solving competency framework associated with the student's majors

## 3 Result

The structure of the problem-solving competency framework associated with majors are presented in Table 1.

Table 1. Structure of problem-solving competency framework associated with majors

Elements of competency	Behavioral indicator	Quality criteria of behavior (Level 3 - highest level)
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1. Learn about problem associated with majors	1.1 Learn about the context and problem situations associated with majors	Aise questions around the context and situations, thereby clearly drawing out signs of problems associated with the major
	1.2 Find out the problems associated with majors	From the correct and sufficient information about the signs of the problem, detect the issues, identify the main problem based on the criteria, and state the problems associated with majors to be solved
2. Propose the solutions to problem-solving associated with majors	2.1 Building a problem tree associated with majors	Propose the causes - consequences of the problem, represented by the problem tree diagram and arranged logically according to the levels
	2.2 Identify the cause can solve	Fully describe the criteria for determining the cause of the problem and precisely determine which causes can be solved
	2.3 Build an objective tree to problem-solving associated with majors	Proposing measures - results of the goal, represented by the goal tree diagram and logically arranged according to the levels
	2.4 Identify priority objectives	Provide evaluation criteria and analyze the objectives' advantages and disadvantages based on the evaluation criteria to determine the priority objectives accurately
3. Implement the solutions to problem-solving associated with majors	3.1 Clarify the way to achieve the objectives	Determine how to achieve the objectives and present them in a logical framework
	3.2 Implement the solutions to problem-solving associated with majors	Implement a solution to a succession of problems, some of which arise from the resolution process itself. In the process of implementation, effective use of reliable resources to problem-solving associated with majors
	3.3 Evaluate and adjust the steps to implement solutions to problem-solving associated with majors	Evaluate the steps in the problem-solving process associated with majors, detect errors and difficulties, make adjustments, and make adjustments on time
4. Evaluate problem-solving activities associated with majors, detecting new problems that need to solve	4.1 Evaluate and adjust problem-solving activities associated with majors	Re-evaluate the entire problem-solving process, come up with optimal solutions to improve problem-solving efficiency associated with majors, and implement those optimal solutions
	4.2 Find out new problems that need to solve	Present the applicability of the results obtained in new contexts and situations, detecting difficulties and problems, thereby identifying new issues associated with the majors to be solved

## 4 Conclusion

From the goal of training students, the output standards of the training program and the job demand, the problem-solving competency associated with the students' majors of the needs to have 4 elements of competency, 11 behavioral indicate, 33 quality criteria of behavior. In the coming time, we will continue improving and organizing pedagogical experiments to have complete and complete conclusions.

## References

1. Burkhard Priemer, Katja Eilerts, Andreas Filler, Niels Pinkwart, Bettina Rösken-Winter, Rüdiger Tiemann, and Annette Upmeyer Zu Belzen, 2020. *A framework to foster problem-solving in STEM and computing education*. Research in Science & Technological Education. 38(1): pp. 105-130.
2. Ismail Marulcu and Michael Barnett, 2016. *Impact of an engineering design-based curriculum compared to an inquiry-based curriculum on fifth graders' content learning of simple machines*. Research in Science & Technological Education. 34(1): pp. 85-104.
3. Do Huong Tra, Nguyen Van Bien, Duong Xuan Quy, Nguyen Xuan Que, and Tuong Duy Hai, 2019. *Teaching to develop the physics competencies in high school*. Publisher of Hanoi National University of Education