ISET 10 (2024): 316-321 e-ISSN 2964-4291
International Conference on Science, Education and Technology http://proceeding.unnes.ac.id/ISET

Profile of Elementary School Teacher Candidates' Understanding of the STEAM Approach

Veryliana Purnamasari*, Eko Handoyo, Arief Yulianto, Barokah Isdaryanti

Postgraduate School, Universitas Negeri Semarang, Indonesia

*Corresponding Author: verylianapurnamasari@students.unnes.ac.id

Abstract. The background that drives this research is that as the times develop, new literacy is needed in the world of education to improve the quality and quality of education by introducing teachers to the STEAM approach. The focus of the problem in this study is how the profile of the understanding of prospective elementary school teachers towards the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach in Semarang City. This type of research is qualitative descriptive. Data collection in this study was carried out by methods of (1) observation, (2) interviews, (3) questionnaires, and documentation. The subject of this study is prospective elementary school teachers in the city of Semarang. The sample taken was students who were studying for the Pre-service Teacher Profession in Semarang City. The data obtained from the results of interviews with teachers, students, and parents were processed using data triangulation. This study concludes that not all students of Pre-service teacher professional education know about the STEAM (Science, Technology, Engineering, Arts, and, Mathematics) approach, but they have unconsciously implemented or applied the STEAM (Science, Technology, Engineering, Arts, and, Mathematics) approaching the learning process. This can be proven by the existence of prospective teachers who can give student assignments in the form of projects.

Keywords: STEAM, elementary school teacher candidates

INTRODUCTION

Technological advancements have changed many things in this world. One of them is the field of education. The use of technology in learning is mandatory and must be understood by teachers. However, mastery of technology alone is not enough. Currently, students must also have 21st century skills to be able to adapt to today's times. Communication, collaboration, critical thinking, and creativity are the focus of developing students' competencies through learning. One approach that can be used to hone 21st-century skills in learning is to apply the STEAM (science, technology, engineering, arts, and mathematics) approach.

The STEAM approach is a learning approach that collaborates these 5 areas and focuses on real-life problems. STEAM focuses on solving problems in everyday life. Through the STEAM approach, students are expected to have problem-solving skills through mastery of science and technology literacy (Sumaya et al., 2021). STEAM-based learning can also be packaged through art learning to make it more fun and produce more artistic works.

The STEAM approach is claimed to make learning more fun, creative, and can improve the quality of learning. The learning problem in elementary school is that a lot is spent on reading, writing, and arithmetic learning which makes students bored and feel pressured to participate in learning (Nasrah et al., 2021). So teachers need to understand the STEAM approach and be able to implement it so that learning becomes fun and children are enthusiastic about participating in learning.

The STEAM approach is able to encourage students to explore knowledge according to their abilities, by arousing curiosity, focusing on the process, developing thinking skills, collaboration, and creating original works (Sukmawati et al., 2023). The importance of the STEAM approach to be understood by educators in elementary schools, so actually since the lecture process at the university, prospective elementary school teacher students have had to learn about the concept of STEAM and need to be given the opportunity to apply STEAM through internships or teaching exercises at school. The hope is that when prospective teachers have graduated to become professional teachers, they can manage learning well and can improve the quality of learning at the elementary school level.

Research Setiyaningsih & Wahyudi (2023) shows that the application of the STEAM approach is able to improve science learning outcomes in grade 5 students. The improvement is seen from the assessment of knowledge and process skills. Students are able to understand the concept of weight and the size of objects around them, and are able to practice how to measure the weight of objects. However, in the study, obstacles were also found, namely students who had difficulty using tools and technology. These

obstacles are natural because learning new things will certainly experience difficulties, confusion, or mistakes. However, from the mistakes experienced, students understand how to do the right thing, and of course can avoid making the same mistakes.

Research (Hasanah, A et al., 2023) develop scientific-based learning models and *loose part* to improve the cognitive ability of PAUD students. This development is carried out based on learning needs, namely teachers are less varied in using learning methods, and lack of use of learning media. This kind of condition results in children's learning activities and creativity becoming less developed. Therefore, the development of learning models and media is expected to be an empirical example to meet the needs of teachers in learning.

The STEAM approach can be implemented in learning, but it also needs to be followed by teachers' ability to manage learning (Putri et al., 2021). This means that to be able to implement STEAM properly, teachers must also master various teaching skills and have pedagogic competence in order to be able to determine appropriate and varied teaching and learning strategies. Students who are prospective elementary school teachers have indeed learned various teaching skills and pedagogical concepts, but it is necessary to analyze how they understand STEAM. The purpose of the study is to analyze the understanding of prospective elementary school teachers regarding the STEAM approach. It is hoped that this research can be an empirical foothold for other research on the importance of prospective teachers to understand the STEAM approach.

METHOD

This study uses a qualitative research method, with the focus of the research being the understanding of students who are undergoing pre-service teacher professional education towards the STEAM approach. The students who were used as the subject of the research came from the elementary school teacher education study program, a total of 20 students. The research was conducted from January to March 2024 from January to March 2024 while students carried out teaching practice activities at school.

The data collection technique uses observation, interviews, questionnaires, and document studies. The observation was carried out 3 times by observing students during teaching practice at school. Observation is focused on the application of the STEAM approach by students in teaching practice. Interviews were conducted with 2 student supervisors, 2 parents, and 3 students in grade 4 who were randomly selected. Interviews with teachers focused on the implementation of the STEAM approach in schools, parents focused on parents' expectations regarding learning at school, and students focused on learning in the classroom. Interviews are conducted directly using open-ended questions.

The questionnaire was carried out to internship students. Focusing on students' understanding as prospective teachers about the STEAM approach and their experience implementing STEAM in schools. The questionnaire is given through *a google form* containing open-ended questions. The study of the document was carried out by analyzing the learning tools prepared by the students. The learning tools are teaching modules, teaching materials, media, and assessment instruments. Data validity techniques use source triangulation and techniques. Data analysis uses data collection steps, data reduction, presentation and conclusion drawn.

RESULTS AND DISCUSSION

The results of the study show that prospective elementary school teacher students all know the meaning of the STEAM approach and argue that the STEAM approach is very suitable and well applied in learning in elementary schools. However, regarding its application in the classroom, not all respondents stated that they had implemented STEAM. Around 70% of respondents said they had implemented, and the remaining 30% said they had not applied.

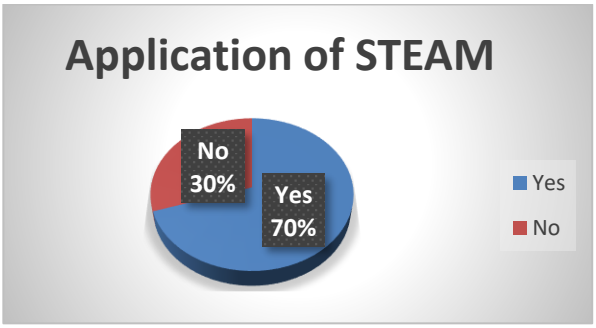

Figure 1 Application of STEAM in Learning

However, the unique thing is that all respondents have basically implemented learning activities that lead to the STEAM approach. This is known from the data on the learning model used

by respondents when teaching. As many as 55% of respondents stated that they used the project based learning (PjBL) model, 45% stated that they used the problem based learning (PBL) model in 3 teaching practices that have been carried out.

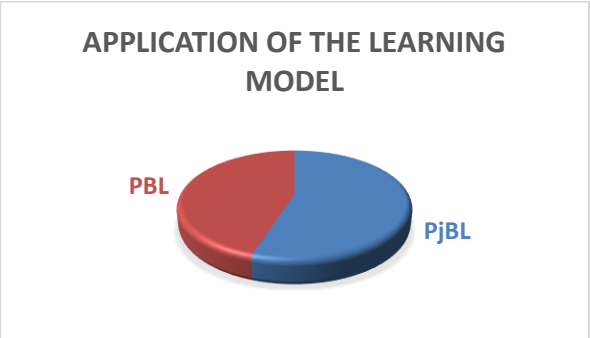

Figure 2 Application of the Learning Model

The results of observation on teaching practice show that respondents when teaching practice have used songs to convey subject matter. For example, in the science of human respiratory system material. Students are given an explanation through songs, by singing students understand the names of human organs and their functions. This kind of learning becomes interesting because students can learn while playing instead of explanations that are only done by giving lectures and students only passively listen. Indirectly, respondents have applied STEAM through the concept of learning with art (Arisyanto et al., 2024) namely using art as a medium to convey other subject matter. The focus is not on songs, but how to use songs to convey the subject matter.

The use of songs shows how STEAM is implemented, namely by integrating art in science and science subjects. (Melalolin et al., 2020) conveying the use of songs as a learning medium can improve students' concentration, memory, and coordination. The use of songs in language learning also helps in practicing pronunciation because students will practice how to pronounce a word in the lyrics of a song. Songs can also be *cultural resource* Because it can use regional songs which can also be a process to introduce local wisdom to children.

The results of the study on the teaching module document made by the respondents also show the same thing, namely the implementation of STEAM through the planning and implementation of the PjBL and PBL models. Respondents have been able to plan the application of the model by arranging learning steps according to the syntax of these models, and are able to apply it to teaching practice. Of course, this data is interesting because unconsciously, students as prospective elementary school teachers have applied the STEAM approach through the application of the PjBL and PBL models, but do not know that the 2 learning models are one example of the STEAM approach.

The PjBL and PBL models are a form of application of STEAM (Lestari et al., 2023), because through these 2 learning models, students carry out critical thinking activities, solve problems through collaboration, be creative in producing a project, and communicate the results of their work, all of which are carried out in groups. Of course, these activities have led to the ability of the 21st century to encourage students to be able to work together in groups.

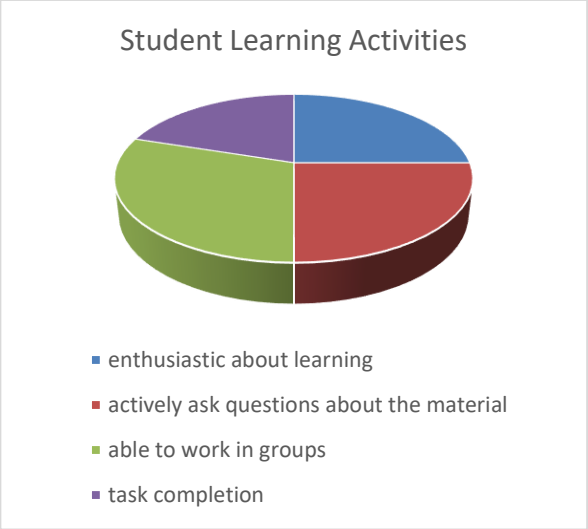

Figure 3 of student learning activities

Respondents stated that the positive results of the implementation of these learning models included students becoming more active in asking questions, having high enthusiasm in learning, being able to discuss and cooperate in groups, and being able to complete the tasks given. This is in line with (Watriana, 2023); (Naufal, M&Asdar, 2022) and (Haderiah et al., 2022) who said that students' activities and learning outcomes have increased. Improvement is not only in the cognitive realm, but also in the affective realm, namely in communication and cooperation skills, and in the psychomotor realm, which is when students work to produce a project.

The implementation of STEAM-based learning is also not without obstacles. Respondents conveyed various obstacles faced, including understanding STEAM, the use of technology, school facilities, time, and the exploration of learning ideas. Indeed, to be able to develop learning by combining various sciences,

teachers need time to explore, find teaching materials, read, and design activities. However, in reality, currently teachers are still more burdened with troublesome administrative tasks, which even interfere with the main duties of teachers as educators and teachers.

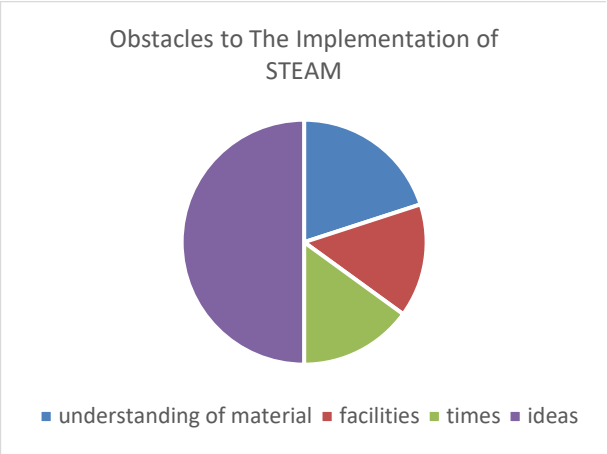

Figure 4 obstacles to the implementation of STEAM

(Qonita et al., 2023) argued that teachers have a good response regarding STEAM-based learning, but various obstacles must be faced by teachers. So what teachers need to do include participating in training or workshops, using objects around the school as learning tools, and looking for references to find learning ideas. Of course, this must be supported by all parties, not just schools. However, the government must collaborate with education academics to organize training and conduct research on STEAM-based learning development so that it can be a reference for teachers.

Similar opinions regarding the STEAM approach were also conveyed by teachers through the interview process. Two teachers who supervise student practice at school, also stated that learning by applying the STEAM approach is very influential in improving students' activities and learning outcomes. For teachers, the implementation of STEAM makes it easier for teachers to carry out their roles in the classroom. Teachers are not tired in delivering material because they must always give lectures and guide discussions, teachers can also carry out their roles, including educators, practice facilitators, classroom managers, program designers, and evaluators (Buchari, 2018); (Nurzannah, 2022).

The ability of teachers to carry out their role in learning certainly affects teacher competence. Professional teachers must master 4 competencies, namely personality, social, professional and pedaogic competencies. (Atmojo, I, R et al., 2020) and (Choirunnisa et al., 2023) stated that the implementation of STEAM-based learning can improve the professional and pedagogic competence of elementary school teachers. In pedagogical competence, the improvement can be seen in the aspects of mastery of teaching and learning strategies, preparation of complete learning plans, and mastery of technology. In professional competence, the improvement can be seen in the aspects of mastering concepts in the fields of science taught, material development, and the application of information and communication technology as a learning medium.

Teachers as informants have shown a good understanding of the STEAM approach. Of course, it is not strange because the 2 informants are professional teachers who have participated in teacher professional education and obtained professional educator certificates, and teachers should understand STEAM and be able to apply it in learning. Research (Riyanti, E et al., 2020) said that teachers and principals did not understand the STEAM approach. However, Riyanti's research can quite understand the condition because the background of the school is in a rural area along with some limitations that the school has that affects the learning process in the school, besides that the lack of socialization and training from the government is also a factor that affects the conditions in the school. (Nuragnia et al., 2021) said that the government has actually provided training on STEAM, but the teachers feel that the training provided is still theoretical, has not touched the level of practice that can be an example of good practice, and can be developed by teachers.

STEAM has become a new breakthrough in learning. The various benefits of implementing STEAM are not only intended for students, but also for teachers because teachers and students are the main components in learning. Creativity is one of the advantages of implementing STEAM. Not only teachers can be creative in learning by combining various disciplines, but more importantly, teachers are able to encourage students' creativity. This creative ability is

expected to imply that students can adapt to the progress of the times, and can survive by solving various problems that arise in the future (Azizah et al., 2023).

CONCLUSION

Not all prospective elementary school teacher students understand the STEAM approach, but indirectly all of them have applied the STEAM approach which is shown by giving projects to students. The learning plan that has been prepared has also shown the application of *a project-based learning* model that can develop critical thinking skills, communication, collaboration, and creativity. So the next thing that needs to be done is to deepen students' understanding of STEAM through the lecture and discussion process.

REFERENCE

Arisyanto, P., Untari, M, F, A., Sundari, R, S., & Purwadi, P. (2024). Development of Educational Dance for Elementary School Students Phase A. *MODELING: Journal of PGMI Study Program*, *11*(1), 496–511.

Atmojo, I, R, W., Ardiansyah, R., Saputri, D, Y., Mulyono, H., & Adi, F, P. (2020). Implementation of Science, Technology, Engenering, Art And Mathematich (STEAM)-Based Learning to Improve the Paedagogic and Professional Competence of Elementary School Teachers Through the Lesson Study Method. *Journal of Basic Education*, *8*(2), 119–123.

Azizah, E. M., Yuhasriati, Y., Khoiriyah, K., Rosmiati, R., & Mandira, G. (2023). Implementation of STEAM-Based Learning in Developing Early Childhood Creativity. *Journal of Obsession: Journal of Early Childhood Education*, *7*(6), 6620–6630.

Buchari, A. (2018). The Role of Teachers in Learning Management. *Iqra Scientific Journal*, *12*(2), 1693–5705.

Choirunnisa, N. L., Suryanti, Istianah, F., Mintohari, & Julianto. (2023). Development of STEAM-Based Learning for Elementary School Teachers, History Article. *CARADDE: Journal of Community Service*, *6*(1), 1–8.

Haderiah, Hasan, K., & Alamsyah, H. (2022). The application of the STEAM approach in improving science learning outcomes of grade V elementary school students. *Pinisi Journal PGSD*, *2*(1), 165–172.

Hasanah, A, W., Sumarno, S., & Dwijayanti, I. (2023). Development of Stem-Based Scientific Learning Models and Loose Parts to Improve Cognitive Ability in Students. *Sinar Dunia: Journal of Social Research Humanities and Educational Sciences*, *2*(1), 42–54.

Lestari, D., Ibrahim, N., & Iriani, C. (2023). STEAM: Science, Technology, Engineering, Art, and Mathematics on History Learning in the 21st Century. *Journal of Education Research and Evaluation*, *7*(2), 306–312.

Melalolin, L. M., Hartini, N. M. S. A., & Mahayanti, N. W. S. (2020). "The Use of Songs as a Learning Media to Increase Understanding of Simple Past Tense." *Journal for Lesson and Learning Studies*, *3*(1), 108–119.

Nasrah, N., Humairah Amir, R., & Yuliana Purwanti, R. (2021). The Effectiveness of the Steam Learning Model (Science, Technology, Engineering, Art, and Mathematics) in Grade IV Elementary School Students. *JKPD) Journal of Basic Education Studies*, *6 Number 1*, 1–13.

Naufal, M, A., & Asdar, A. (2022). Students' Perception Of Prospective Mathematics Teachers Towards Slingshot Steam Products In The Application Of Mathematics Learning. *Journal of Eduscience (JES)*, *9*(3), 880–891.

Nuragnia, B., Nadiroh, & Usman, H. (2021). Steam Learning in Elementary Schools: Implementation and Challenges. *Journal of Education and Culture*, *6*(2), 187–197.

Nurzannah, S. (2022). Peran Guru Dalam Pembelajaran. *ALACRITY : Journal of Education*, *2*(3), 26–34.

Putri, M. A., Wulandari, C., & Febriastuti, A. R. (2021). Implementation of the Steam Learning Approach Made of Loose Parts in Developing 21st Century Skills in Early Childhood. *ABNA: Journal of Islamic Early Childhood Education*, *2*(2), 118–130.

Qonita, Q., Mulyana, Hendri, E., Loita, A., Anggraeni, I., Az-Zahra Sakinah, S., & Siti Sopiah, N. (2023). Teachers' Perception of STEAM Learning at UPI Labschool Kindergarten, Tasikmalaya City. *Journal of Art Education*, *6*(1), 341–356.

Riyanti, E, D., Roshayati, F., & Purnamasari, V. (2020). The Profile of Elementary Teachers' Understanding in STEAM (Science, Technology, Engineering, Art, and Mathematics) Approach. *Jurnal Ilmiah Sekolah Dasar*, *Volume 4*,(4), 678–686.

Setiyaningsih, A., & Wahyudi, R. (2023). Application of the STEAM (Science, Technology, Engineering, Art, and Mathematics) Approach to Improve Science

Learning on the Theme of Objects Around Us in Grade V Students of SD Negeri 2 Kebumen for the 2021/2022 Academic Year. *Kalam Cendekia: Scientific Journal of Education*, *11*(01), 218–225.

Sukmawati, N. I., Ika, N., & Rakhmawati, S. (2023). The Effect of Steam Learning (Science, Technology, Engineering, Art, and Mathematic) to Improve Critical Thinking and Problem Solving Skills in Early Childhood. *Concept: Journal of Social Humanities and Education*, *2*(1), 127–141.

Sumaya, A., Israwaty, I., & Ilmi, N. (2021). The application of STEM approaches to improve the learning outcomes of elementary school students in Pinrang Regency. *Pinisi Journal of Education*, *1*(2), 217–223.

Watriana, S. (2023). The Application Of The Steam Approach To Improve Activities And Learning Outcomes In Reaction Rate Materials. *Journal of Education and Teacher Training*, *2*(2), 182–190.