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Skills in Constructing and Implementing Learning Designs for Preservice Mathematics Teacher at Universitas Samudra

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Abstract

Several preservice mathematic teachers prepare their final projects using a learning strategy (a model, method, or approach) related to one or more mathematical competencies. This research project examines the use of this tactic through a (quasi) experimental learning approach. Upon selecting a learning approach, some final-year students investigate its impact on enhancing students' mathematical proficiency. Aim of this research is to determine the suitability profile of the final assignment of preservice mathematic teachers at Universitas Samudra between the title and the learning design applied and to find solutions to improve the understanding of preservice mathematic teachers at Universitas Samudra in preparing their final assignments. The results of the praxiological analysis skills in constructing and implementing learning designs for preservice mathematic teachers at Universitas Samudra are: 18,18% of the learning implementation plan is in accordance with the learning model and is explained in the final assignment discussion. 42,42% of the learning implementation plan is in accordance with the learning model but is not explained in the final assignment discussion, and 23,33% of the learning implementation plan is not in accordance with the chosen learning model.

Keywords: PCK, Design, Praxiological Analysis, Preservice Mathematic Teachers.

1. Introduction

In an effort to become a superior scholar, there are several competencies that undergraduate students must have. One of the academic skills that students must master as academics is the ability to write scientific papers (Juniarti, 2019; Nagari et al., 2020). One form of scientific work that students must create is a final assignment. Some students experience difficulties in preparing their final assignments, which have an impact on the relatively long study period. Problems arise from various aspects, especially from mastery and knowledge of scientific writing (Rahmiati, 2013; Supeni, 2018). In fact, problems do not only arise when students have started working on their final assignment; from before the final assignment, namely when preparing their final assignment proposal, students have experienced difficulties (Kirana et al., 2008). This has the potential for more serious and bigger problems, such as increasing academic cheating by students, lots of plagiarism, no new topics emerging, students' understanding that is not comprehensive, and so on. The research team focused on the problem of incomplete understanding among final-year students because they were only pursuing graduation without paying attention to their understanding of the final assignment they made. Even basic things, such as language, often occur in students' final assignment writing, in this case preservice mathematics teacher. According to (Darminto, 2021), grammatical errors appear in the final assignments of preservice mathematics teacher (spelling errors at 35%, (2) non-compliance with guidelines at 12%, and (3) Indonesian grammar errors at 15%).

In managing good and quality learning, educators must have pedagogical competence and professional competence (Faridah et al., 2020). This statement is also supported by what (Adrianova et al., 2021) stated: pedagogical competence and professional competence are basic abilities that every teacher must have in order to learn. Mathematics education students are projected to become mathematics educators. According to (Shulman, 1986, 1987) in his concept of pedagogical content knowledge (PCK).

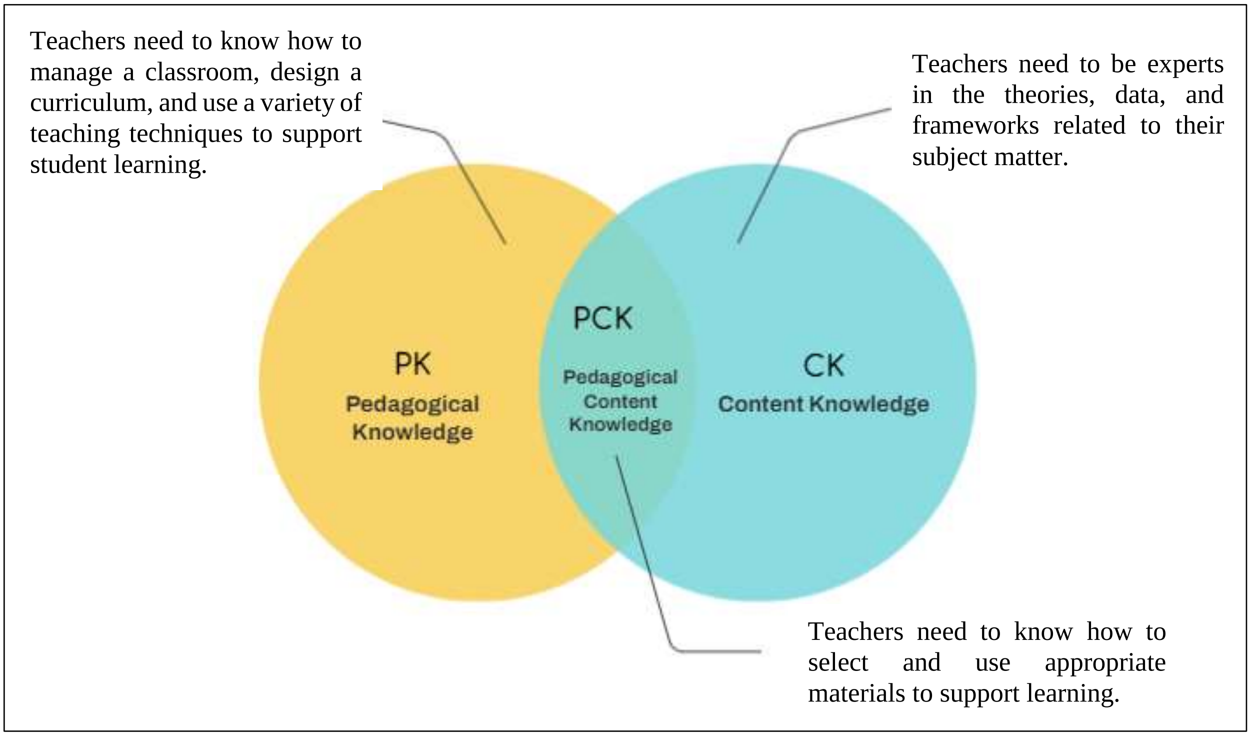


Figure 1. Concept pedagogical content knowledge (PCK)

A teacher, apart from having to master subject content, must also be able to teach that content. Today, we know pedagogical competence and professional competence as pedagogical content knowledge (PCK). PCK is knowledge formed from the intersection of content and pedagogical knowledge. Pedagogical knowledge is related to pedagogical competence, and content knowledge is related to professional competence. preservice mathematic teachers needs to be familiar with various alternative concepts and obstacles that may be faced by students with diverse backgrounds. Apart from that, preservice mathematic teachers must also be able to organize, compile, implement, and assess lesson material, all of which are contained in PCK. (Ma'Rufi et al., 2017) said that mathematics teachers' PCK is very important for the success of student learning and is important to study on an ongoing basis. PCK skills are very important for teachers and preservice teachers to have. To become a professional educator, one must have PCK skills (Prasart, 2011).

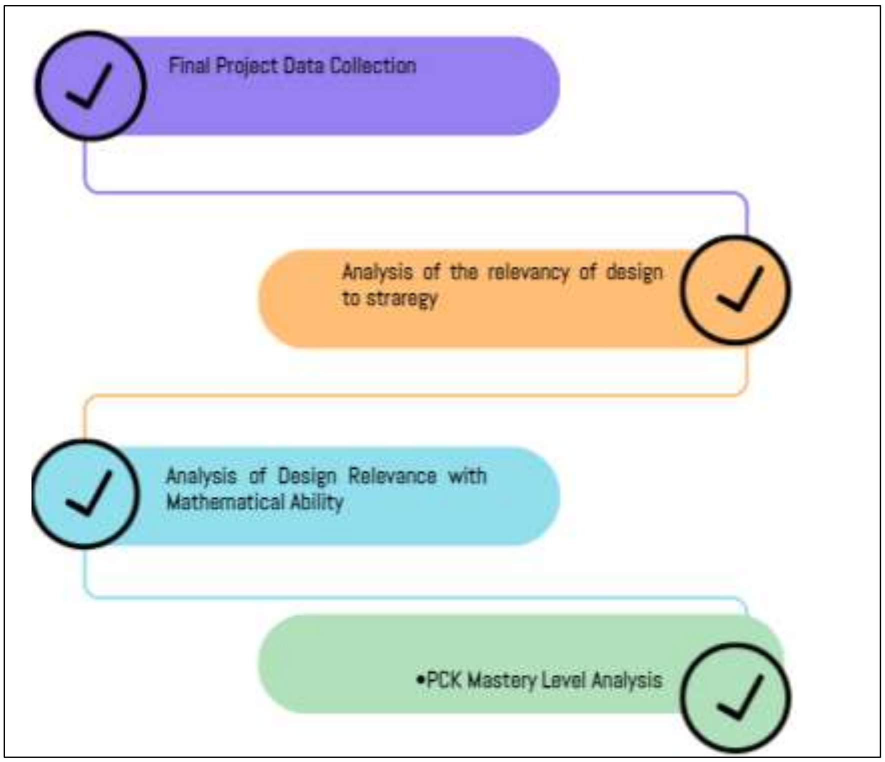
A question arises (which is also a concern) about whether the design applied by final-year preservice mathematics teacher is a relevant design or not. The design created must answer the needs in terms of mathematical abilities and must also be in accordance with the content of the chosen learning strategy. Based on this problem, the research team was interested in studying and analyzing the level of relevance of the final assignments of preservice mathematics teachers at Universitas Samudra. The specific objectives of this research are 1) to determine the level and description of the relevance of learning design to the strategy being studied; 2) to know the level and description of the relevance of learning design to the mathematical abilities being studied; and 3) to know the level and description of pedagogical content knowledge (PCK) of prospective preservice mathematics teachers.

The completion of the final assignment is frequently a barrier for students to finishing the study period, which makes the research concerning. Students who struggle with the final assignment will take longer to finish their studies, which will also contribute to an increase in academic fraud. Examples of this include excessive plagiarism, topics that are not new, and a lack of comprehensive understanding among students, which includes preservice mathematics teachers at Universitas Samudra. To help students finish their final assignments more easily, skills in constructing and implementing learning designs for preservice mathematic teachers at Universitas Samudra are required.

2. Methods

In this research activity, the research team will use praxeological analysis. This research uses content analysis techniques with a qualitative approach (Waruwu et al., 2023). Referring to (Nova et al., 2023; Siagian & Herman, 2023), the technique used in this research is a theoretical tool for analyzing broad-spectrum problems where the quality of information is the basis for inference. In this research, the team will examine several final assignments of preservice mathematic teachers at Universitas Samudra over the last five years. The final assignment in question is a final assignment related to learning strategies and mathematical abilities.The final assignment data will be analyzed using procedures using praxeological analysis originating from the Anthropological Theory of the Didactic/ATD (Mortensen & Winslow, 2010; Putra & Witri, 2009). To enable the analysis to describe explicit results, the proposing team will create and use a praxeological reference model from which the design is built based on the content to be analyzed (Andriatna & Kurniawati, 2024; Azzumar et al., 2023; Mortensen & Winslow, 2010; Nova et al., 2023). The analysis of the relevance of this final assignment is intended to investigate the mathematical praxeology that appears in the learning design used in the final assignment research of preservice mathematic teachers at Universitas Samudra. To this end, an analytical framework will be developed to address mathematical praxeology, task types, techniques, and logos. Logos blocks are not explained separately because of the challenge of distinguishing them from instructional design. In addition, parts of the logos block can be inferred from the explanation of the techniques presented for solving mathematical tasks.In more detail, the analysis carried out by the team consisted of three stages. These stages are in accordance with the objectives of this research. The first analysis is an analysis of the level of relevance of learning design to learning strategies. The analysis continues with analyzing the level of relevance of learning design to mathematical abilities. The final analysis is an analysis of the level of pedagogical content knowledge (PCK) mastery.

More technically, the following is an overview of the research process flow that the research team is planning.



Pigure 2. Flow of Research Activities

Final Project Data Collection: at this stage, the researcher focuses on collecting relevant data for the research. Steps generally taken include determine data sources, collect data from identified secondary sources, storing and managing data. In determine data sources deciding whether data will be obtained from primary sources (e.g., surveys, interviews, direct observations) or secondary sources (e.g., journals, books, previous reports). In Storing and managing data: Ensure data is stored safely and well organized.

Analyze the Relevance of Design to Strategy. At this stage, researchers analyze how the research design or research instrument design is relevant to the strategy used. The steps include: reviewing research design, analyzing compliance with strategy, identifying strengths and weaknesses. In reviewing research design: Assess whether the research design is aligned with the research objectives and questions. In analyzing compliance with strategy: Assess whether data collection and analysis methods support the research strategy. review whether the approach used is in accordance with the theory or model adopted in the research. In identifying strengths and weaknesses, note the advantages and disadvantages of the research design related to the chosen strategy.

Analysis of Design Relevance with Mathematical Ability. At this stage, researchers analyze how the research design or instruments used are relevant to the mathematical abilities being measured. The steps include: reviewing measurement objectives and analyzing instrument suitability. In reviewing measurement objectives: Assess whether the objectives for measuring mathematical ability are clear and specific. In analyzing instrument suitability: Assess whether the instruments used (e.g., test questions, questionnaires) are suitable for measuring mathematical abilities. Ensure that the instrument covers various aspects of relevant mathematical abilities.

Analysis of the Mastery Level of PCK (Pedagogical Content Knowledge). At this stage, the researcher analyzes the level of PCK mastery of the individual or group that is the research subject. The steps include: Identifying PCK components, designing measurement instruments, collecting data, analyzing data, and Conclusion. In identifying PCK components: Determine the aspects of PCK that will be measured, such as knowledge of the material, teaching strategies, and student understanding. In designing measurement instruments: Create instruments that can measure various components of PCK, such as interviews, classroom observations, or questionnaires. In collecting data: Carrying out data collection through instruments that have been designed. In analyzing data: analyze the data to determine the level of PCK mastery.Use appropriate statistical techniques or qualitative analysis. In conclusion: Summarize findings regarding the level of PCK mastery and provide recommendations for professional development or further research.

3. Result and Discussion

The subjects of this research are preservice mathematics teachers who were enrolled in the Mathematics Education degree program at Universitas Samudra from 2019 to 2023. The research specifically focuses on the final assignments submitted by these students as part of their degree requirements. This cohort consists of 66 former students who completed their final assignments within this time frame. The participants include all preservice mathematics teachers from the specified period, ensuring a comprehensive analysis of the learning designs developed during their academic training. These students were all enrolled in the Mathematics Education degree program, which is part of the Faculty of Teacher Training and Education at Universitas Samudra. The selection criteria for the research subjects are straightforward. Only those students who have completed and submitted their final assignments as part of their degree program requirements are included in this study. The subjects must have been enrolled in the Mathematics Education degree program during the specified period, and their final assignments must be accessible for analysis. This ensures that all relevant data and materials are available for a thorough praxiological analysis. The primary objects of this research are the final assignments created by the preservice mathematics teachers. These assignments typically consist of detailed lesson plans, teaching strategies, and reflections on the teaching-learning process. The research aims to analyze these documents to understand how well the lesson designs align with effective teaching strategies and educational theories, as well as the extent to which the designs promote the development of mathematical abilities among students. Additionally, the analysis will focus on the practical and theoretical components of the designs, including the rationale behind chosen methodologies and approaches, and will seek to identify innovative and effective practices in mathematics teaching as demonstrated in the final assignments. The final assignments will be systematically collected and analyzed using a combination of qualitative and quantitative methods. Key aspects of the analysis include examining the content of the lesson plans and teaching strategies to identify themes and patterns, applying specific rubrics to evaluate the quality and relevance of the designs, comparing different assignments to identify commonalities and differences in teaching approaches and effectiveness, and analyzing reflective components to understand the preservice teachers' perspectives on their own teaching practices and design decisions. Below are presented the results of the praxiological analysis. Skills in constructing and implementing learning designs for preservice mathematic teachers at Universitas Samudra.

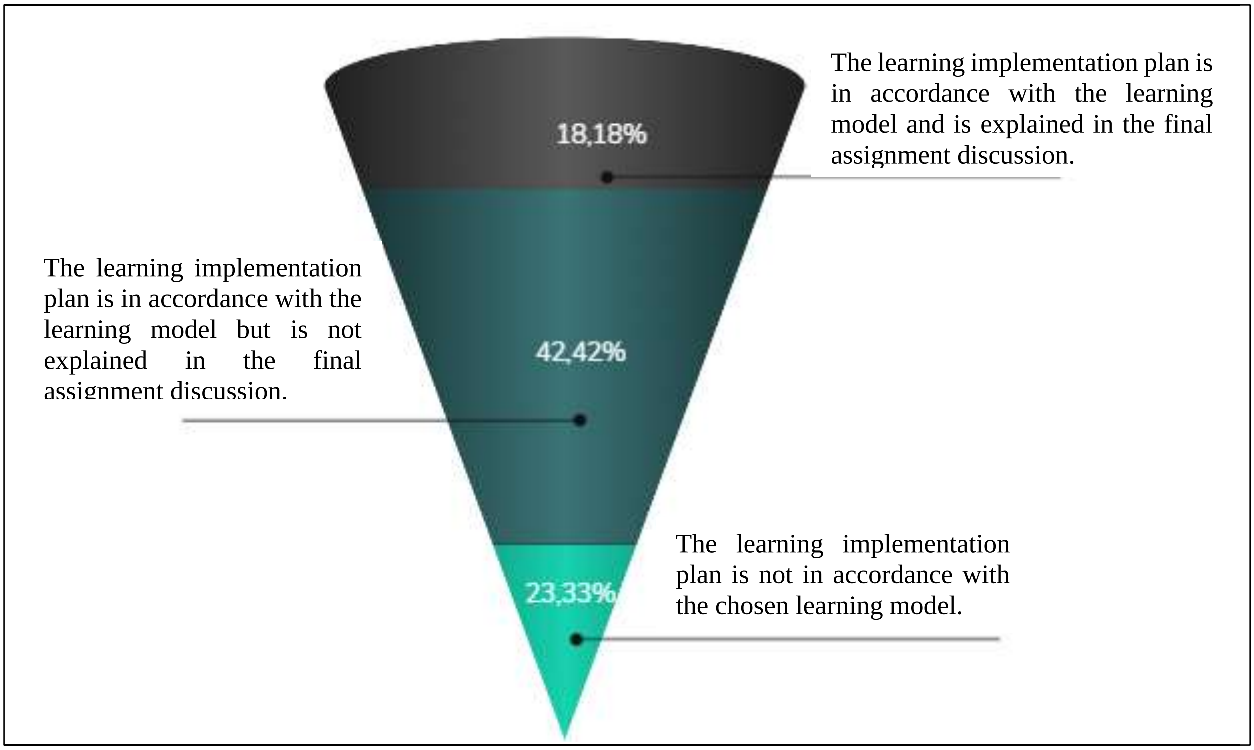


Figure 3. Praxiological analysis final task of preservice mathematic teacher

Based on the results of the praxiological analysis above, it can be concluded that of all the learning implementation plans analyzed in the final assignment, only 18,18% are truly in accordance with the learning model chosen and explained in detail in the discussion of the final assignment. This means that only a small portion of the total lesson plans analyzed meet the criteria for suitability for the chosen learning model. This means that of the 66 lesson plans, only 12 actually use certain learning models well. In discussing the final assignment, students are only able to explain in detail and evaluate the 12 lesson plans in the context of the chosen learning model. As many as 42,42% of the lesson plans analyzed were prepared according to the chosen learning model, indicating that preservice mathematic teachers have an adequate understanding of how to prepare lesson plans that suit a particular learning model. However, although the lesson plans are appropriate, they are not explained or analyzed in detail in the discussion of the final assignment. This could mean that preservice mathematic teachers may not have enough space or focus in their final assignment to discuss all lesson plans in depth, or they may lack skill or experience in explaining and analyzing lesson plans in an academic context**.** As many as 23,33% of the lesson plans analyzed were not in accordance with the chosen learning model, indicating that there were several lesson plans that were not designed in accordance with the principles or theories underlying the learning model. This can be caused by a lack of understanding by preservice mathematic teachers about the chosen learning model, errors in implementation despite theoretical understanding, or external factors such as limited time, resources, or support that influence the suitability of the lesson plan to the chosen learning model.

Overall, this data illustrates that there are several challenges in preparing and discussing lesson plans that are in accordance with the learning model in the final project. Even though many lesson plans are in accordance with the learning model, students' ability to explain and analyze these lesson plans in their final assignments still needs to be improved. In addition, some lesson plans that are not in accordance with the learning model indicate that there is a need to increase understanding and skills in implementing the learning model effectively. Educational institutions need to provide better training and guidance to ensure that students are not only able to prepare lesson plans that suit the learning model but are also able to explain and analyze them in an academic context. By improving their theoretical understanding and practical skills, as well as their academic writing abilities, students will be better able to compose, apply, and discuss lesson plans that are in accordance with the learning model effectively in their final assignments.

4. Conclusion

The conclusion of this research is that it was found that there were two challenges that preservice mathematic teachers had finishing their final tasks. The first difficulty is the demand for novelty, which allows final-year students to make efforts that are relatively more difficult because they have to look for novelty. This also has an impact on a lack of understanding in the realm of pedagogical content knowledge (PCK), which is caused by the element of novelty that is put forward, namely the learning model. recency. Conceptually, preservice mathematic teachers do not fully understand the learning model, and practically, students do not have experience applying the chosen model. The second problem is the technical problem of making learning plans, which do not show a high level of suitability between the model chosen in the title and the application of learning in schools. This is also the impact of a lack of insight.

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