

Prospective Elementary Teachers' Experiences on Mini Research Projects on A Design Research Course

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ABSTRACT

Design research is an emerging research method in mathematics education, but it has a potential to be applied in elementary education. To support prospective elementary teachers' competences in designing learning instruction for elementary schools, we develop a design research course in the elementary teacher education study program in the University of Riau, Pekanbaru, Indonesia. The course has been delivered to prospective elementary teachers since 2023 by the first author. The course consists of lectures about various educational design research approach and mini research projects on designing a learning instruction for a specific topic for elementary school students after the mid-term exam. We examine prospective elementary teachers' experiences on the mini research projects to evaluate effectiveness of the design research course. The results of this study could be used to develop the design research course for the future.

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INTRODUCTION

Quality teacher training is a significant factor in enhancing educational outcomes. One endeavor to generate effective teacher candidates is to offer them with real-world research experience since their education. Design research is a research method that is commonly used in the field of education, particularly to develop and evaluate learning interventions systematically (Doorman, 2019; Gravemeijer & Cobb, 2006).

Prospective teachers who participate in research activities are encouraged to gain research skills and a deeper understanding of the learning and teaching process (Munthe & Rogne, 2015). Therefore, the study program of the first author in the University of Riau provides a design research course to give opportunity to carry out a mini research project by third year prospective elementary teachers. This initiative seeks to give aspiring teachers the opportunity to be directly involved in research activities, from developing research questions to devising techniques, collecting, and analyzing data, and presenting research findings (Akin & Uzuntiryaki-Kondakci, 2018). This

experience is extremely beneficial to future teachers because it gives them a better understanding of how to conduct classroom research and use the results to enhance their teaching techniques. In addition, they can also develop reflective and collaborative abilities, which are very necessary in the teaching profession.

A mini research project is quite relevant in the teacher education course because it allows prospective elementary teachers to investigate a variety of issues and challenges related to learning in elementary schools (Haryono & Adam, 2021). Through this research project, prospective teachers can identify and analyze real problems faced by students or teachers in the classroom, as well as propose solutions or learning strategies that are innovative and based on empirical evidence.

Although in principle the benefits of design research experience for prospective elementary teachers seem promising, there is little empirical research examining how they actually engage in these kinds of projects and how they perceive the learning experience. The purpose of this study was to examine the experiences of elementary education students participating in a mini design research project as part of the design research course. thus, the research question guides this paper is stated as “how do prospective elementary teachers perceive the experience of engaging in mini design research projects?

This study adds to existing research on involving prospective teachers in design research by comprehensively evaluating the lived experiences of a group of prospective elementary teachers. These insights can help develop and maximize integrated design research experiences in teacher education courses.

METHOD

This research uses a design research method with a project-based learning approach. In the first half semester, prospective elementary teachers were given knowledge about different types of educational design research. The first researcher introduced the prospective elementary teachers to 5 different types of educational design research that are popular in Indonesia, namely research and development with ADDIE model (Branch, 2009), research and development with 4D model (Thiagarajan et al., 1974), Design Research based on Plomp's perspective (Plomp, 2013), Design Research for learning instruction from Gravemeijer's perspective (Gravemeijer & Cobb, 2006), and didactic engineering from French perspective (Barquero & Bosch, 2015).

Participants in this study were 24 third year students who took design research courses from the two classes offered. This course is an elective course in the elementary school teacher education study program at the University Riau. Data collection was carried out in semester 2 of the 2023/2024 academic year, which was the second year this course was offered.

Before the mid-term evaluation, the participants were divided into 5 groups for each class (10 groups in total). Each group was asked to explore and study one research method regarding educational design research. They explained their understanding of the method. In the last half semester, the participants were asked to design a project that emphasizes aspects of learning in elementary schools. Students were given 2 months to carry out the project starting from design, development, implementation, and evaluation. While carrying out the project, they could discuss with the lecturer and other participants to evaluate the implementation of the project.

The data used in this study focuses on evaluations submitted by students regarding the projects that have been carried out. The first researcher gave 4 open questions to the participants via Google Classroom which is integrated with the institutional Gmail accounts of lecturer and

participant. In this paper, we focus on the first question given to students regarding their experience of projects in design research courses.

RESULTS

The results of this study are presented from an analysis participants' answers to questions related to their experiences in carrying out design research-based mini projects. In general, we found two important points conveyed by prospective elementary teachers regarding their experiences in design research-based mini research projects which are described as follows:

Improving Prospective Elementary Teachers' Research Experiences

This mini research project using a design research approach could increase the research knowledge and experience of prospective elementary teachers, especially for those who have never previously taken a research methods course. This statement was delivered by 13 prospective elementary teachers. One of them was conveyed by PET5 as follows:

“In my opinion, the experience of being involved in a design research project in this course is very valuable. The project provides an opportunity to deeply understand design research methodology and purposeful design practice. Through this project, I was able to apply the theories learned directly in a real context, which helped improve my understanding of the creative and analytical processes in design. Apart from that, being involved in this project also hones team collaboration skills, time management, and effective presentation of ideas. This experience gave me valuable insight into how to formulate appropriate research questions and implement appropriate methodologies in a design project.”

PET5 stated that the mini research project provides participants with the opportunity to explore educational research methods, especially design research. Through this experience, they could apply educational theories in real contexts in elementary school learning. Apart from that, designing a mini research project based on design research provides space for them to be able to formulate research problems and find answers through collaboration.

The same statement was also made by PET21. She said that a mini research project could increase experience on how to conduct research and be useful for preparing essays later.

Increase active participation and new experiences for pupils

This design research-based mini research project requires prospective elementary teachers to be more creative in designing learning instruction in elementary schools. Many of them design science and mathematics learning based on digital technology such as using virtual reality, Phet Simulation, and GeoGebra. This innovative design could increase active participation and new experiences for pupils involved when implementing the design. This was expressed by 5 prospective elementary teachers. The following was conveyed by PET14.

“From my experience of being involved in a project using virtual reality in science learning, pupils seem to enjoy learning using virtual reality and they think that by using this media they remember the lesson material better, enjoy it more, and are less tense. Their understanding of the learning material lasts longer because they see firsthand how the solar system in outer space looks like. Meanwhile, if they study, they usually only use books and

it is not varied, therefore they only see the solar system in books and learning is not fun, most pupils are sleepy so their learning results decrease.”

PET14 carefully states how science learning design assisted by virtual reality could motivate pupils to learn science. Apart from that, their understanding of the learning material is better and can last longer compared to conventional learning which only relies on textbooks.

PET19 also conveyed the same thing. Her team designed mathematics learning using PhET simulation. Through this application, pupils have new experiences in understanding mathematical concepts and improve their critical thinking skills.

“My view regarding the experience I gained in this project is that I was able to broaden my knowledge and was able to study the PhET simulation website that we used in this project well. Where on the website there are several learning subjects that can be applied to pupils in elementary school, one the other is mathematics learning. In this project we discuss fraction games on the website. By using this website, pupils can experience new experiences related to learning fractions and can also help them improve their critical thinking skills in solving problems in the PhET simulation games.”

Apart from the two main aspects conveyed by students, several students also said that this design research-based mini research project was able to build attitudes, knowledge, and skills. In the attitude aspect, students stated that they had a more optimistic attitude after doing this project. Those who previously found it difficult and afraid of the assigned project, finally they were able to do it well. Through this project, students realize that they will increase their knowledge about design research. Apart from that, this mini research project improves students' skills in collaboration, critical thinking, and problem-solving abilities, especially in the field of education.

CONCLUSION

The design research course with a mini-research project approach assigned to prospective elementary teachers provides some benefits for them and for the pupils. They have research experience that is useful in supporting them to be able to solve learning problems in elementary schools through appropriate instructional learning. Attractive learning designs, especially integrating technology, can support students' learning, especially in mathematics and science learning in elementary schools. Pupils are more motivated to learn and are also able to increase their understanding of the material being studied. Therefore, design research-based mini research projects have the potential to support increasing prospective elementary teachers' competences in designing learning instruction (Gravemeijer & Cobb, 2006; Haryono & Adam, 2021; Munthe & Rogne, 2015).

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