Simulation-Based Project Model for Pre-Service Teacher Teaching and Learning

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ABSTRACT
This development research aims to develop a teaching simulation project teaching model for learning and teaching preservice teacher-student in teaching practice. This learning innovation is motivated by the implementation of learning simulations generally carried out by teaching with role-playing with lecturers as supervisors, students practice as teachers, other students as students, and observers. The repeated implementation shows that there are weaknesses in the learning model used. In line with this, the teaching simulation project model was developed based on the TPACK framework and the flipped classroom approach. Model development is carried out by adapting the development model from Dick & Carey which consists of eight steps. In this article, the results presented are limited to the seventh step for expert testing through a validation instrument in the form of a questionnaire which is analyzed using quantitative and qualitative descriptive techniques. The expert test shows the model is feasible in terms of basic theory, model concept, syntax, supporting tools, and learning innovation.

Keywords: preservice teacher, teaching and learning model, project-based, flipped classroom, TPACK

1. INTRODUCTION

In line with the use of technology in Higher Education with the Teacher Study Program, this topic is a great opportunity to plan learning designs that require preservice teacher students to be competent in operating various learning technologies [1]. This is intended to advance the knowledge and skills of prospective teachers about innovative technology in learning as a means of supporting global competency skills [2], [3]. These skills will support the initial training program for prospective teachers, providing a technology-based framework that they can project later in a professional manner [4], [5]. This certainly opens up opportunities to develop technology-based framework competencies from student-teacher candidates to produce more authentic simulations [6].

In this regard, a preliminary study conducted in the Primary Teacher Study Program of Universitas Negeri Malang, Indonesia shows that the implementation of learning simulations is carried out in the middle to the final semester to equip students with teaching skills. Simulations are carried out classically in offline meetings with student role-playing as teachers, students, and supervision. Simulations are carried out repeatedly by the RPP compiled at the previous meeting. The repeated implementation shows that there are weaknesses in the learning model used, students who have to repeatedly act as students and these roles tend not to be carried out optimally, such as inviting jokes or answering inappropriate contexts when students are playing a role as a teacher to disturb concentration and a conducive atmosphere for teaching. Besides that, other students also seemed not enthusiastic about observing the learning simulation, were busy with their respective devices or other activities because they had repeatedly seen the learning simulation and the focus of the lecturer was only on students practicing.

This field finding is certainly inversely proportional to the ideal conditions and demands expected of future teacher candidates as described at the beginning of the paragraph. The gap shows the need for innovation to transform learning that includes teaching practice activities to provide the best experience for preservice teacher-student [7]. In line with the university vision to applies an effective learning approach and optimizes the use of technology [8], [9]. In this study, a learning innovation is proposed by developing a special model for simulated learning in a blended learning system. The model development will carry a project-based flipped classroom approach and regulated learning cells to fulfill the novelty element as an innovation that is different from previous learning.

The development of this model is important because it is in line with the application of the blended learning system in digital learning with offline and online activities. Learning simulations can be packaged into a class project to produce documentation of learning simulations that are more authentic [10], useful, and more efficient. Class projects are adapted from the project-based learning model that has been widely studied before to increase creativity [11], [12], and is applied with the flipped classroom approach in the blended learning system to increase the effectiveness of network-based learning [13], [14]. These three concepts are applied within the TPACK framework (technology, pedagogy, and content knowledge) to provide experience and competence in a technology-based framework according to educational science [15], [16]. Based on this, the objectives were formulated to develop a teaching simulation project model based on TPACK and flipped classroom in the blended learning system.

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2. METHOD

Learning innovation is carried out by adopting the Dick & Carey (1983) development model which has eight systematic steps. This model was chosen with consideration of the integrity of the steps which can be taken in stages. This learning innovation is carried out in eight stages in line with the model selection from Dick & Carey (1983) as follows. The first stage, identifying learning objectives, analyzing course outcomes (CPMK) according to the PGSD S1 Study Program. The second stage, determining targets and conducting a needs analysis for the development of a teaching simulation project model using an open questionnaire data collection technique for PGSD undergraduate students. The third stage, formulating general and specific objectives for product development for the teaching simulation project model to be achieved in the learning innovation scheme. The fourth stage, developing products according to objectives and the results of the needs analysis relate to the selection of designs according to user characteristics. The fifth stage, formulating learning strategies that will be used in the application of the model with flipped classrooms and self-regulated learning.

The sixth stage, determining and designing materials for the application of the teaching simulation project model in learning according to the researcher's scientific field, namely Indonesian language learning in elementary schools. The seventh stage, designing and implementing a formative evaluation by validating the learning model to experts and testing the application of the model with small group traying and whole class traying out to determine the eligibility criteria and the effectiveness of the learning model. The eighth stage conducts a comprehensive product revision based on the results of formative evaluation according to the achievement of criteria, weaknesses, and input suggestions obtained from experts and users. From the results of product revisions, dissemination is carried out according to the target product users.

Data in development research for this learning innovation were collected through questionnaires, tests, and documentation. The questionnaire used is in the form of closed and open questionnaires in the form of offline or online to collect data from expert validation and test results data. The test is used to measure student learning outcomes from the application of models according to course outcomes. Documentation is used to collect reference data, history of model development and revisions, as well as journals of implementation and research progress. The research data were analyzed using quantitative and qualitative descriptive techniques.

3. RESULTS

3.1. Product Design

Following the concepts used in the development of the teaching simulation project learning model, an in-depth theoretical study of the TPACK components was carried out, the implementation of flipped classrooms, project-based learning, and self-regulated learning. Product design and implementation are seen in Figure 1.

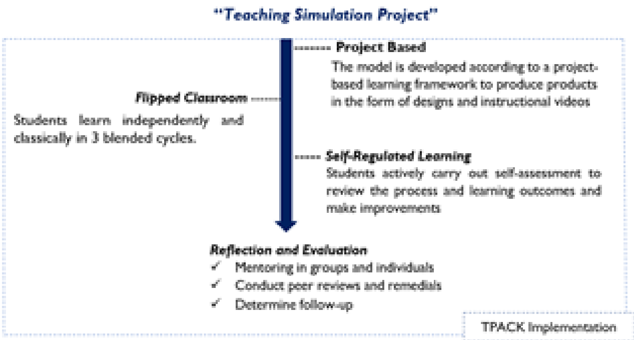

Figure 1 Teaching Simulation Project Model Design

From this design, the objectives and syntax of applying the model in learning were then developed. The objectives of the model are formulated into four points according to the performance framework that student-teacher candidates will do in applying the following model. First, developing teaching skills in the context of digital learning, in this model preservice teacher-student will apply blended learning to provide experiences in synchronous or asynchronous networks and network lines according to the demands of teacher professional competence and digitizing learning in the 4.0 century. Second, developing skills in the use of digital learning tools or sources, related to the previous goal of students indirectly training and being skilled in utilizing various digital tools and resources for learning. Third, develop skills in designing TPACK-based learning, according to the TPACK component the model does not only focus on the use of technology but skills in teaching (pedagogy) and managing content. Fifth, developing creativity in teaching and producing learning products, according to the model base in project learning and teaching simulations packaged as learning products.

Furthermore, the model is implemented in three cycles in the blended system, namely the first cycle for material orientation, the second cycle for project I, and the third cycle for project II. In each cycle, a self-assessment is carried out to stimulate the formation of student self-regulated learning, followed by a reflection on building a conducive atmosphere for students to learn. The project basis of the learning model is realized from the learning outcomes in each cycle as follows.

Table 1 Syntax of The Model

Cycle	Syntax	Description
I	1. Orientation: Basic Concepts and Learning Outcomes	CK (*content knowledge*)
	2. Pre-Class 3. Material Deepening	
	4. In Class: Confirmation and Reinforcement	
	5. Out of Class: Evaluation and Reflection	
II	6. Orientation: 1st Project Planning	PK (*pedagogical knowledge*)
	7. Pre-Class: 1st Project "Learning Design"	
	8. In Class: Presentation and Peer Review	
	9. Out of Class: Evaluation and Reflection	
III	10. Orientation: 2nd Project Planning	TK (*technology knowledge*) > TPACK
	11. Pre-Class: 2nd Project "Learning Simulation"	
	12. In Class: Presentation and Peer Review	
	13. Out of Class: Evaluation and Reflection	

3.2 Product Trial Results

Product testing is carried out with expert validation and product application testing on users. Expert validation is carried out to determine the feasibility of the product from learning experts with basic educational expertise. Validation includes (a) basic theory, (b) model concept, (c) model syntax, (d) supporting tools, and (e) learning innovation. The following is the product validation result data.

Table 2 Results of Validation

No.	Indicator	N	F	%	Description
1.	Theoretical basis	24	23	96	feasible, without revision
2.	Concept Model	20	19	95	feasible, without revision
3.	Syntax	28	27	96	feasible, without revision
4.	Support Device	16	16	100	feasible, without revision
5.	Innovations	16	15	94	feasible, without revision
Mean				**96,2**	
Eligible Qualifications, without revision					

Based on the results of product validation, it is known that the teaching simulation project model developed meets every product feasibility indicator. In the table, it can be observed that the product achievement reaches service qualifications (96.2%) from the basic indicators of theory, model concept, model syntax, supporting tools, and learning innovation. The suggestion obtained from the results of expert validation is to apply a scientific approach according to the basis of project learning which is used as a theoretical framework for model development.

From the results of this validation, an overall evaluation of the model developed is then carried out to determine product improvement. Regarding expert advice, the development team decided not to explicitly apply the scientific approach as a conceptual framework for developing this model. Implicitly, the steps from the scientific approach by observing, asking, reasoning, trying, and communicating have been integrated into learning activities starting from the first cycle with the second cycle as follows.

4. DISCUSSION

The product that was successfully developed in this study was a special learning model for practice and learning simulations for preservice teacher students consisting of three cycles and twelve steps. Learning cycles and steps are an important part of a learning model that contains syntax for designing and implementing learning scenarios [19]. The steps in the learning model are arranged in a systematic and measured manner, containing exploration, elaboration, and confirmation [20]. Exploration in the model is shown by orientation activities and deepening of the material that requires the active student-teacher candidate as individuals who learn and will be more meaningful for him [21]. The elaboration of the model is manifested in the material discussion stage followed by confirmation on evaluation [22] and reflection for ideal conditioning, which is to consider the readiness and continuity of the learning process for knowledge construction [23].

Knowledge construction is directed at HOTS for the education of student-teacher candidates for three cycles. In the first cycle, knowledge construction is directed at analytical skills (C4) so that from the results of the analysis, prospective teacher students can construct knowledge of the material content [24], [25]. In the second and third cycles, knowledge construction is directed at the ability to evaluate (C5) and create (C6).

In the second cycle, prospective teacher students will design their learning designs which are then exchanged for peer review activities with their peers, peer review activities will improve the ability of prospective teachers by exchanging information and experiences [26], [27]. In the third cycle, the teacher students will practice their design in a learning simulation. In the model developed the simulation is packaged as a learning product in the form of a video with various models that are easier to evaluate in peer review learning. It is during this peer review that learning is expected to be more meaningful and comprehensive for student-teacher candidates [28], [29].

Each cycle has orientation, preclass, in-class, and outclass by applying the flipped classroom approach which conditions student teacher candidates to have provisions of knowledge and skills before class meetings [30]. This approach is believed to be effective for higher education because it stimulates individual learning readiness [31] in accommodating, constructing, and confirming knowledge [32].

The application of this approach is under the basic indicators of module theory which are considered feasible with orientation plotting to provide reference and direction, preclass for material deepening and independent exploration, in class for the confirmation and reflection process, and outclass for evaluation and determining follow-up plans for the process and student learning outcomes of prospective teachers [33]. In line with the function of implementing this flipped classroom, the results of previous studies show the advantages of implementing flipped classrooms in a blended system to improve learning performance [34]. The results also show the effectiveness of the application of flipped classrooms in higher education on student learning outcomes compared to conventional lectures [35].

Learning models are developed based on projects, namely designing and implementing individual learning simulations by student-teacher candidates as a product of learning outcomes. The project-based is used so that prospective teachers can prepare designs and simulations within a systematic framework [36]. The implementation of project-based learning based on the results of previous research shows a positive impact on student learning outcomes and processes [37] because it is oriented towards individual and group activities in project fulfillment [38]. The results of other studies indicate that this project base plays an effective role in activating students compared to the conventional model [39]. In the model, it can be observed that from the first cycle to construct the knowledge of prospective teacher students in the form of basic theories, concepts, and examples of their application. Continued in the second cycle, student-teacher candidates compiled learning designs in several meetings as the first project and continued in the third cycle to carry out learning simulations as the second project. From the entire third step, this cycle describes planning, implementation, and evaluation as an indicator of the project basis in learning [40].

The TPACK framework applied in the model includes various learning activities carried out by student-teacher candidates in their teaching practice. In the TPACK framework, mastering content, pedagogy, and learning technology will require student teacher candidates to actively observe, ask questions, collect, associate, and communicate according to expert advice [41]. When the first cycle was constructed of knowledge about the content of the material to be learned, knowledge of the content became an indicator of the professional competence of teachers so that prospective teachers must master the material to be taught and its limitations [42].

After that, pedagogical knowledge of prospective teacher-students is constructed which will be applied in designing learning plans starting from formulating goals, determining models, strategies, media, assessments, and other tools that will be used in learning [43]. In the last cycle, student-teacher candidate students' technological knowledge is constructed which is then integrated with content and pedagogical knowledge to form the TPACK framework.

5. CONCLUSION

The teaching simulation project model was developed as a special model in learning and teaching student teacher candidates in learning practices. The teaching simulation project model was developed within the TPACK framework which consists of three cycles. The first cycle is for content knowledge construction, the second cycle is for pedagogical knowledge construction, and the third cycle is for technological knowledge and the three combined are content, pedagogical, and technology in learning practice through simulation. This framework is integrated with a project base in learning to design and implement simulations systematically as learning outcomes based on expert testing. This research will be continued at the next stage for field testing by applying the model to learning.

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