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Multimedia for Teaching Skills Development in Pre-service Teachers

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Abstract

A teacher must have teaching skills in order to become a professional teacher. The purpose of this article is to present the results of research on the development of teaching skills multimedia for microteaching courses in the Biology Education Study Program, FMIPA, State University of Jakarta. Multimedia is designed by combining text, images, audio and video to present basic teaching skills material in an interactive and interesting way. This research consisted of two years, in the first year four basic multimedia teaching skills were developed, namely: opening and closing lesson skills, class management skills and basic questioning skills and advanced questioning skills. This research is research and development (RnD) which was adapted into 7 stages from 10 steps of development research by Gall, Gall and Borg, including 1) research and data collection, 2) planning, 3) making prototypes, 4) testing first prototype, 5) prototype improvements, 6) field trials, 7) product improvements. The multimedia products developed are evaluated and assessed by experts, then revised based on the suggestions given and the results of field trials. The results of the research show that the multimedia developed is valid, practical and effective for improving teaching skills of pre-service teachers. Through this article the author wants to suggest that PKM or microteaching lecturers can use multimedia to practice basic teaching skills.

Keywords: *multimedia, teaching skills, pre-service teachers.*

INTRODUCTION

Teaching skills are fundamental abilities that teacher must have to manage the learning process in the classroom effectively. The FMIPA UNJ Biology Education Study Program curriculum includes Teaching Competency Development (PKM) or microteaching courses to give prospective teacher students insight and opportunities to learn the basic teaching skills that need to be mastered. Mastery of basic teaching skills is very important for student teachers so they can carry out good teaching practices.

Unfortunately, based on the results of interviews with lecturers and students who have taken microteaching courses, it is known that there is no multimedia that specifically exemplifies good and correct teaching skills. Based on this background, it is necessary to develop multimedia basic teaching skills in the Biology Education study program.

According to Tunney in Ismail (2015), basic teaching skills consist of 8 types of skills, namely: 1) Classroom management skills, 2) leading small group discussion skills, 3) small group teaching skills and individual (teaching small group and Individual skills), 4) skills in using variations (using variation skills), 5) skills in opening and closing lessons (opening and closing session skills), 6) skills in explaining (explaining skills), 7) skills in asking (questioning skills), and 8) giving reinforcement skills. According to Passy (1976) in Sugihartini (2019), there are 9 teaching skills, namely: 1) Reinforcement, 2) Basic Questioning, 3) Variability, 4) Explaining, 5) Introductory Procedures and Closure, 6) Advanced Questioning, 7) Classroom Management and Discipline, 8) Guiding Small Group Discussion, 9) Small Group Teaching and Individualized Instruction. There are 21 teaching skills that teachers need to be mastered such as: the skills in writing instructional objectives, the skills in introducing the lesson, the skills in questioning, the skills in explaining, the skills in probing questions, the skills in illustrating with examples , the skills in giving variation, the skills in using silence and nonverbal cues, the skills in giving reinforcement, the skills in increasing pupil's participation, the skills in using black board, the skills in achieving closure, the skills in recognizing attending behavior, the skills in experimentation, the skills in diagnosing difficulties of students related to subject matter, the skills in using teaching aids, the skills in maintaining the science laboratory, the skills in giving assignments, the skills in developing critical and independent thinking among the students, the skills in maintaining discipline, and the skills in pacing the lesson (Candiasa, I, 2010). Based on needs analysis and in accordance with the curriculum of the Jakarta State University Biology Education study program, the eight teaching skills in sequence are basic questioning skills, advanced questioning skills, reinforcement skills, variation skills, opening and closing skills, small group discussion skills, class management skills, and leading group discussions. Each teaching skill has important components that need to be considered as a reference for the content of the material presented in multimedia.

In an effort to help prospective teacher students master basic teaching skills, learning media are needed that are interactive, interesting, and in line with current technological developments. One of the media that can be used is learning multimedia. Multimedia can integrate various media formats such as text, images, audio and video to present complete and interesting information (Ivers & Barron, 2002).

The use of multimedia in teacher education has been shown to enhance pre-service teacher's knowledge and skills. Theelen (2020) found that 360-degree videos, when combined with theoretical lectures, improved pre-service teachers' knowledge structures and application of interpersonal knowledge. Similarly, Liu (2019) demonstrated that project based learning, particularly in the areas of information-based instructional design, resource integration, and teaching evaluation, enhanced pre-service teachers' informatization teaching abilities. The effectiveness of multimedia interventions and multimedia vignettes in developing pre-service teachers with the basic skills of teaching. Technological interventions yielded statistically significant gains in preservice teacher knowledge and skills for delivering reading instruction to students with disabilities when compared with traditional modes of instruction. (Zepp, 2024). Finally, Ratnawati (2021) emphasized the importance of Multimedia-based learning media in equipping pre-service teachers with the basic skills of teaching. A multimedia-based learning media for basic skills of teaching lessons is appropriate and interesting to use. Using multimedia in the teaching and learning process is important to improve their achievements, understanding, performances, and to achieve objectives of language pedagogy (Faridah, 2020). These studies collectively underlined the potential of multimedia in improving pre-service teachers' teaching skills.

This research aims to develop multimedia learning of basic teaching skills for prospective teacher students. Multimedia is designed by combining text, images, audio and video to present basic teaching skills material in accordance with the reference criteria for each component of teaching skills. The Biology Education study program, as a producer of Biology teacher candidates, certainly needs to equip its students with basic teaching skills as a provision when they carry out Teaching Skills Practice (PKM) at school. So this research is important because the resulting multimedia in the form of videos on basic teaching skills can be a reference for teachers and prospective teachers. However, considering that this research will take a lot of time (time-consuming) and require a lot of funds (big budgeting), these 8 teaching skills videos will be developed over two years. In this research, multimedia development of 4 basic teaching skills will be carried out in year I and 4 other basic teaching skills in year II.

RESEARCH METHODS

This research is development research (R&D) using the Gall, Gall and Borg model. The steps by Gall, Gall and Borg in Putra (2020) include 1) research and data collection, 2) planning, 3) making a prototype, 4) testing the first prototype, 5) improving the prototype, 6) field trials, 7) operational product improvements, 8) operational trials, 9) final product

improvements, and 10) dissemination. However, due to time constraints and the large amount of funding that may be required to carry out all the steps above, this study is limited to step 7. These steps can be seen in the following Figure 1.

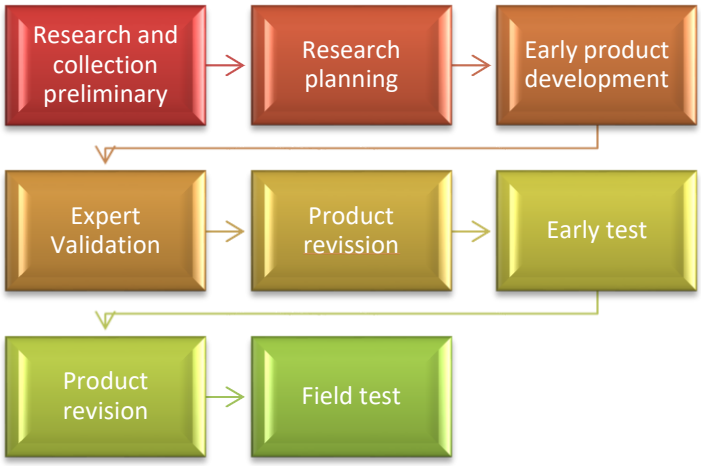

Figure 1. Step development of teaching skills multimedia

Instruments used in the preparation stage, such as content expert questionnaires, media expert questionnaires, design expert questionnaires, user questionnaires and simulation scripts for each teaching skill, were also evaluated, especially to see the suitability of the items in the instrument. Data were analyzed quantitatively to determine the validity and suitability of the items in the instrument using the Gregory formula with cross-tabulation as shown in Table 1.

Table 1. Cross tabulation Gregory formula

		Expert 1	
		Not relevant (score 1-2)	Relevant (score 3-4)
Expert 2	Not relevant (score 1-2)	A	B
	Relevant (score 3-4)	C	D

$$\text{Gregory coefficient} = \frac{D}{A+B+C+D}$$

A = Shows disagreement between both evaluator
B = Shows the differences in answer between evaluator
C = Shows the differences in answer between evaluator
D = Shows valid agreement between evaluator

Criteria for the level content validity can be seen in Table 2.

Table 2. Criteria of level content validity

Gregory Coefficient	Validity Level
0,91 – 1,00	Very high
0,71 – 0,90	High
0,41 – 0,70	Enough
0,21 – 0,40	Low
0,00 – 0,20	Very low

Specifically for the user questionnaire validation tryout involving 25 students, the Pearson formula was used to see item validation. At the evaluation stage after initial prototype development, the product was tested by 3 experts, namely content experts, media experts and design experts. Each was given a questionnaire containing the components that had to be assessed. The questionnaire contains 12 question items with a scale of 1-4, where 4 = very good, 3 = good, 2 = not good and 1 = not good. To calculate the percentage score for each question, use the formula:

$$\text{RS} = \frac{f}{n}\ x\ 100\%$$

RS = Percentage of student/lecturer responses with certain criteria

f = number of values for each sub variable

n = maximum number of scores

The percentages obtained then transformed into several qualitative categories as presented in the Table 3.

Table 3. Qualitative Categories of Validity

Interval	Criteria
81% - 100%	Very good
61% - 80%	Good
41% - 60%	Medium
21% - 40%	Poor
0% - 20%	Not Good

Apart from providing values in the form of numbers, experts also provide feedback or suggestions to be taken into consideration in further product improvements.

RESULTS AND DISCUSSION

The development of multimedia Biology teaching skills is based on a needs analysis that in the Biology Education Study Program Faculty of Mathematic and Science Jakarta State University there is no multimedia that specifically exemplifies good and correct teaching skills. Therefore, researchers are interested in conducting research related to the development of

multimedia teaching skills because every teacher or pre-teacher really needs to master how to teach good and interesting skills in school. It is hoped that this research can increase knowledge and can become a reference for teachers or prospective teachers.

Initial observations were carried out during semester 118 in the Teaching Competency Development course to analyze which teaching skill needs needed to be prioritized. This needs analysis involved 76 students taking microteaching courses using a microteaching assessment instrument. Micro-teaching is a technique used in teacher preparation program to get training and improving teaching skills among pre-service teachers (Mahendran, 2023). The observation instrument for implementing microteaching is in the attachment. The results of these observations then became the basis for conducting research on multimedia development for PKM lectures at the Biology Education Study Program, FMIPA, Jakarta State University. Based on the results of observations during microteaching activities, data was obtained that students' skills in opening and closing lessons, class management skills and basic questioning skills and advanced questioning skills were still lacking. Therefore, in this first year, these 4 skills will be a priority for creating multimedia teaching skills first.

The first step in the preparation stage is to prepare an instrument whose suitability is validated so that it is in accordance with the objectives of developing the instrument. The instruments developed were a content expert questionnaire, a media expert questionnaire, a language expert questionnaire and a user questionnaire. The next stage is making a storyboard for each multimedia video teaching skill that is selected as a priority. The instrument validation results can be seen in the Table 4.

Table 4. Instrument Validation Result

The instrument developed	Score	Category
Teaching skills storyboard	0,90 – 0,96	Very high
Feasibility of material expert validation questionnaire indicators	0,82 – 0,93	High – Very high
Feasibility of media expert validation questionnaire indicators	1	Very high
Feasibility of the design expert validation questionnaire indicator	0,93	Very high
Validation of the user questionnaire	From 18 items, 12 items were valid and 6 items were less valid and invalid, so 12 items were used in the questionnaire.	

Based on the validation results, the instrument is ready to be used in the form of a validation questionnaire. The next stage is creating a storyboard. There were 4 storyboards created in this first year of research consisting of: Opening and Closing Lesson Skills. Class Management Skills, Basic Questioning Skills and Advanced Questioning Skills. Each basic teaching skill has certain criteria that need to appear in each multimedia basic teaching skill.

a. Opening and closing session skills

This skill is related to the way the teacher starts learning, creates a conducive learning atmosphere, and motivates students to follow the lesson. Opening and closing lessons are crucial components of effective teaching, as they set the tone for learning and help students consolidate their understanding. Opening and closing lessons may look easy, but many teachers have not delivered well and there are still many teachers who ignore the components of opening and closing lessons. In microteaching, preservice teachers need to improve because opening lessons (set induction) is an effort or activity carried out by teachers in teaching and learning activities to create mental preconditions for students so their attention is focused on the material to be studied resulting in a positive effect on activities learned (Majid, 2015). Hawa (2022) emphasizes the need for teachers to generate motivation and provide encouragement during these phases, while Ganske (2017) underscores the importance of lesson closure in solidifying student learning. Ginting (2017) further highlights the significance of various types of opening moves in classroom interaction, with a focus on elicitation. From some of the above definitions above, it can be concluded that opening and closing sessions, as they can significantly impact student engagement and learning outcomes.

b. classroom management skills

The most important factor at success in education is the teacher's level of classroom management skills. Classroom management skills are the teacher's skills in creating and maintaining optimal learning conditions and returning them to optimal conditions if disturbances occur, either by means of discipline. Effective classroom management is crucial for student engagement and academic achievement (Gage, 2017). This involves a range of skills, including planning, coordination, organization, communication, decision-making, and reward systems (Ergin, 2019). According to Cooper et al. (2011), has several important components such as designing classrooms and building a sense of care and respect to teaching behavioral norms and responding to violations of applicable norms. The six tasks in managing a classroom are: 1) (designing the physical environment), 2) building student-

teacher relationships, 3) fostering an atmosphere of community, 4) teaching the norms for behavior, and 5) responding to inappropriate behavior.

c. Basic questioning skills

Questioning skills are skills that must be carried out in every learning process. Questioning skills are useful for provoking students to think, and can also be used to measure students' understanding of the material that has been taught. There are important things in questioning skills, namely: pausing (giving students a moment to think about finding answers), prompting (encouraging and directing the teacher to be able to facilitate all students and lead students to the new knowledge they want to achieve as a result of their thinking process), probing (tracking, guiding, directing, probing is carried out because a satisfactory answer has not been obtained, the teacher appoints another student to answer). Questioning skills are divided into 2, namely basic questioning skills and advanced questioning skills. Basic questioning skills are:

(1) Clear and concise,

Questions should be short and clear, with words that students understand. Convoluted questions will not be understood so students will most likely not be able to answer them. The order of words must be adapted to the age and level of development of students.

(2) Provision of references,

Teachers need to provide reference questions that contain information that is relevant to the answers expected from students before asking questions.

(3) Concentration,

Questions asked by teachers can be divided into several forms of questions, namely broad questions and narrow questions. A broad question is when the teacher demands a general and quite broad answer, while a narrow question is when the teacher demands a very specific answer. Narrow questions require students to focus their attention on specific things that need to be studied.

(4) Transfer of turns,

There are times when a question, especially a fairly complex question, cannot be answered completely by a student. In this case, the teacher needs to provide opportunities for other students by transferring turns. This means that after the first student gives an answer, the teacher asks the second student to complete the answer, then asks the third student again and so on.

(5) Distribution,

Spreading questions means spreading out turns to answer questions asked by the teacher. Teachers need to pay attention to distribution techniques, especially for teachers who usually ask questions to certain students. So that everyone gets a turn to ask questions, the teacher can ask as many questions as there are students, but in answering questions the teacher needs guidance when there are students who are unable to answer.

(6) Giving time to think

In answering a question asked by the teacher, students need time to think. A teacher should not be hasty in collecting students' answers. Therefore, give time to think to answer the question and so that students can answer clearly without feeling burdened by uncertain answers.

(7) Providing guidance

Teachers must be able to guide students gradually so that their answers lead to the perfect answer. Incorrect answers cannot be left alone so that other students can imitate the correct answer. To further direct the correct answer, the teacher can direct or provide guidance as follows (1) Phrasing, that is, asking the question again in another way that is easier and simpler, so that it is better understood by students, (2) Asking other, simpler questions that can guide students find the answer, (3) Repeat the previous explanation/information related to the question asked (Nasution, 2019).

d. advance questioning skills

A teacher can continue from the basic questioning skills stage. These advanced skills are questions asked by a teacher more specifically. Advanced skills carried out by teachers should make students more able to master basic competencies in accordance with learning objectives. Advanced questioning is:

(1) Changing cognitive level guidance

The questions asked by the teacher must be able to guide students from cognitive level questions that simply remember facts to broader and deeper questions, such as understanding, application, analysis, synthesis and evaluation. Based on changing these guidelines, students can master Bloom's taxonomy in the cognitive field from C1 to C6.

(2) Setting the order of questions,

A teacher should not ask questions to students at will without giving a clear sequence. The form of questions should start from the simpler to the most complex in sequence, or in other words, giving easy questions to difficult questions. Teachers should avoid asking questions back and forth from easy or simple to difficult then to difficult again.

(3) Tracking questions, and

If the answers given by students are not perfect or not correct, the teacher can ask tracking questions. This tracking question aims to make it easier for students to give correct and perfect answers.

(4) Encouraging interaction.

To encourage interaction in the classroom, what the teacher must pay attention to is that the questions asked by the teacher should be answered by the students, but all students are given a brief opportunity to discuss the answers with their close friends. The teacher should be a reflecting wall, if a student asks a question, don't answer it directly, but give other students the opportunity to answer it or it can be discussed in the class forum

The next stage is making a multimedia prototype of basic teaching skills, starting from the shooting stage. This stage includes several activities such as looking for model teachers and students, preparing them with a simulation script, shooting practice and shooting. Image taking was carried out intensively for 7 days in the Microteaching laboratory of the Biology Education Study Program. The obstacles experienced during shooting were difficulties in finding the schedule between the model teacher and the model students, as well as other supporting matters such as the use of a microteaching laboratory. Documentation during shooting can be seen in the Figure 2:

Figure 2. Documentation during shooting teaching skills multimedia

When the shooting process is complete, the next stage is the video editing stage. This process consists of cutting and merging videos, inserting narration, text, animated images and other material. The program used for video editing is Adobe Premiere Pro 2022. Next are the stages of sound cutting, dubbing and background music. The sound is cut to create video sound that suits your needs and eliminates noise in the video. Then proceed with the process of inserting music, animated text, logos and transitions. Transitions are needed to make text, videos and animations appear natural and smoother from one session to the next.

After developing the prototype, validation is then carried out on the multimedia prototype of the basic teaching skills being developed. This multimedia is evaluated from 3 aspects of expertise, namely content experts, media experts and design experts. The validity

test is carried out by providing an assessment by an expert (Expert Judgment). Multimedia is evaluated regarding aspects that are measured based on certain theories that support the research, then expert judgment provides suggestions and comments on the multimedia. The final stage, namely expert judgment, provides a decision. The results of the assessment from expert validation are presented briefly in the **Table 5**.

Table 5. Teaching Skills Multimedia Prototype Validation Results

Multimedia	Expert content	Media Expert	Design Expert
Opening and closing lesson skills	82 % (good)	81,33% (good)	80% (good)
Basic questioning skills	88% (very good)	80% (good)	80% (good)
Advanced questioning skills	86% (very good)	85,3% (very good)	78% (good)
Class management skills	84% (good)	84% (good)	80% (good)

Based on Table 5, it is known that the overall evaluation of the multimedia products being developed is of good to very good quality in terms of the three aspects of material, media and design with a percentage range of 78% - 88%. However, this does not mean that this product is perfect, there are still several weaknesses that need to be improved. According to the input, suggestions and comments provided by the validator, the multimedia being developed must include learning objectives, does not highlight the important components of each basic teaching skill, the multimedia for class management skills is too long in duration, and the sound is too quiet, so improvements need to be made. Improvements to the video are made by stating the learning objectives shown in the video at the beginning of the video, displaying a summary of the learning that has been shown at the end of the video, and shortening one of the learning activities in the video.

After the product has been repaired, the product is ready to be tested in the field. The field trial will be carried out in the 120 semester microteaching class, involving 20 students in this trial. Microteaching lecturers are asked to teach using developed multimedia. The field test was carried out in two meeting sessions. In the first session, multimedia skills for opening and closing lessons and class management skills will be tested. Furthermore, in the second session, multimedia basic questioning skills and advanced questioning skills were also tested. Each trial session lasts 100 minutes or the equivalent of 2 hours of lecture. At the end of each session,

participants or students and lecturers are asked to fill out a questionnaire to assess the quality of the revised multimedia based on responses from experts. The results of field trials are presented in the Table 6.

Table 6. Results of limited trials of multimedia teaching skills

Multimedia	Assesment	
	Pre-service teacher	Lecturer
Opening and closing lesson skills	97,4% (very good)	84,8% (very good)
Basic questioning skills	90,3% (very good)	85,3% (very good)
Advanced questioning skills	89,6% (very good)	80,1% (good)
Class management skills	93,1% (very good)	89,3% (very good)

Based on the table 6, according to students, the four multimedia products for basic teaching skills development results are in the very good category. According to the lecturer's assessment of opening and closing skills, basic questioning skills, class management skills are in the very good category, while advanced questioning skills are in the good category. The results of the research show that the multimedia developed is valid, practical and effective in improving the mastery of basic teaching skills of prospective teacher students. The validity of multimedia is proven by the assessment of material experts and media experts who state that multimedia is suitable for use in learning.

The practicality of multimedia is proven by the positive response from students towards the use of multimedia in learning. The effectiveness of multimedia is proven by the increase in student learning outcomes after using multimedia. Research consistently shows that the use of multimedia in education has a positive impact on student learning and understanding. Ibrahim (2021) found that interactive multimedia applications can improve student concentration and understanding of subject matter. Plakhotnik (2022) further emphasizes the importance of multimedia in professional training, highlighting its ability to present information in a visually integrated form and its role in implementing various pedagogical methods. Wirawan (2021) and Dzhaparova (2021) both provide practical examples of the benefits of multimedia in education, with Wirawan demonstrating how it can increase educators' understanding and students' interest, and Dzhaparova showing its effectiveness in teaching mathematics and enhancing student professional engagement.

The multimedia developed contains basic teaching skills material presented in the form of text, images, audio and video. This multimedia helps pre-service teacher students

understand concepts and real examples of the application of basic teaching skills in the classroom. Virtual media can be used to reduce student fear, nervousness, anxiety, fear of mistakes, and stage fright during microteaching or the teaching practice process (Rahmawati, 2022).

CONCLUSION

Based on the results, it can be concluded that the development of multimedia learning for basic teaching skills for student teachers can improve their mastery of basic teaching skills. The multimedia developed is valid, practical and effective for use in learning. This research contributes to efforts to improve the quality of prospective teachers through the use of multimedia technology in learning. The effectiveness of interactive multimedia microteaching is based on changes in student's knowledge, performance, and positive responses.

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