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The Effectiveness of Using Microteaching Books Based on Case Method and Team Based Project on Basic Teaching and Communication Skills of Biology Education Students

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Abstract: This study aims to determine the effectiveness of using microteaching books based on case method and team based project on basic teaching and communication skills. The type of research is development to produce a product and test the effectiveness of that product. The population is all 5th semester students of the biology education study program, FMIPA Unimed who take the microteaching course, the test sample is 30 students. The research design uses the Plomp development model, namely Analysis, Development, and Evaluation. Data collection is carried out at the analysis stage, then the development stage includes the distribution of assessment sheets to experts and response sheets to lecturers and students in the microteaching course. Meanwhile, the evaluation stage is carried out using observation sheets to assess basic teaching skills and communication skills. The data were analyzed using descriptive statistics and then categorized following the guidelines for categorizing needs, assessments, responses and communication skills. The results obtained indicate that the microteaching book is declared valid, has a fairly good level of practicality, and is effective in improving basic teaching skills and communication skills.

Keywords: Basic teaching skills; Case method; Communication skills; Microteaching; Team based project

Introduction

Microteaching is a method that has long been used in education to prepare prospective teachers to master basic teaching skills. This method allows prospective teacher students to practice teaching techniques in a controlled environment, with simulation scenarios designed to resemble the real teaching process. In the Biology Education Study Program at the State University of Medan (UNIMED), microteaching is an important course to support the development of student competencies. However, various challenges arise in the implementation of microteaching, especially related to basic teaching skills and communication skills.

Basic teaching skills are the main foundation that must be possessed by Biology Education study program students as prospective biology teachers. These skills include the ability to design, deliver, and evaluate learning effectively, as well as build good communication with students. Biology teachers are not only tasked with conveying information, but also ensuring that students can understand concepts that are often abstract and complex, such as genetics, ecology, or biochemistry.

Basic teaching skills help prospective teachers: 1) Use appropriate learning strategies, such as demonstrations, experiments, and interactive discussions; 2) Simplify difficult concepts into easy-to-understand ones through visual media, props, or

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analogies; 3) Manage time effectively in delivering material so that all learning objectives are achieved. According to Arends (Arends, 2012), teachers who are skilled in delivering material effectively are able to increase students' learning motivation and their learning outcomes.

Overcoming this problem requires more intensive training, the development of a relevant microteaching curriculum, and the provision of adequate resources to support biology educators to become more competent. One of the curriculum developments carried out in the biology education study program at the State University of Medan (UNIMED) is by implementing a case method and team-based project-based lecture approach. The case method and team-based project approaches have proven effective in overcoming this problem. The case method allows students to analyze real-world situations through relevant case studies, so that they can understand the various dynamics that occur in the learning environment. According to Johnson et al. (2021), this method not only improves critical thinking skills but also helps students identify applicable solutions. Meanwhile, team-based projects encourage students to work in teams, develop interpersonal communication, and understand the importance of collaboration in education.

However, there is no comprehensive guide specifically designed to support the implementation of microteaching based on case method and team-based project in the Biology Education Study Program, UNIMED. This kind of guidebook is very much needed to provide clear direction to students, while also helping lecturers in facilitating microteaching learning.

This study aims to design a microteaching book based on case method and team-based project that can improve students' basic teaching skills and communication skills. With this book, it is expected that students will be able to apply theory and practice simultaneously, and develop better interpersonal communication skills. This book is also expected to be a relevant and applicable reference for the development of teacher education at UNIMED, especially the biology education study program.

In the study of microteaching book design based on case method and team-based project, several theoretical foundations need to be outlined to understand the concepts underlying this study. This review includes a discussion of microteaching, case method, team-based project, and basic teaching and communication skills.

Microteaching

Microteaching is a learning method that aims to train teaching skills in a controlled environment with limited time, audience, and scope of material. This method provides an opportunity for prospective teachers to gain teaching experience gradually before facing real classroom situations. According to Allen et al. (1969), microteaching is a training technique that focuses on developing specific skills in the teaching process, such as opening lessons, asking questions, or using learning media.

In the context of Biology Education, microteaching can be used to train prospective teachers in conveying complex biological concepts, such as anatomy, ecology, or genetics, with an approach that is interesting and easy for students to understand (Purwanti, 2020). Various studies have shown that microteaching can effectively help prospective teachers develop classroom management skills, design learning strategies, and improve their pedagogical communication skills (Novianti et al., 2022).

Microteaching is one way to train skills or the process of guiding and educating in a small or limited environment. Microteaching learning can also be said to be the initial stage of teaching, which aims to create teaching skills and competencies through the application of teaching principle skills. Likewise, with microteaching, students or prospective teachers can truly adapt and gain real experience in teaching practice. If the implementation of microteaching can run well, it will bring various benefits to teachers in the future (Apriani et al., 2020).

The OMTA microteaching paradigm is also effective when used in microteaching lectures, according to the findings of Adnyana et al. (2019), study additionally, orientation, modelling, training (Practices) & assessment (OMTA) microteaching approach is used in lectures with great effectiveness, student comments are highly favorable, and students' teaching knowledge and skills fall into the very good category. The Independent Curriculum-Based Teaching Module's usefulness in maximizing students' conceptual understanding (Abdullah et al., 2025).

Case Method

The case method emphasizes the process of solving cases or problems faced scientifically, by placing cases or problems as keywords in the learning process (Mardhatillah et al., 2025). The case method is a method of in-depth exploration of a problem, which allows for investigative analysis (Minniti et al., 2017).

The case method is designed to support the development of critical thinking skills, problem solving, and students' intellectual capacity. According to Simatupang et al. (2024), the Problem Based Learning (PBL) learning model can increase interest in learning biology. The results of the literature review show that PBL can be used in various ways, such as helping to increase students' interest in learning biology.

Therefore, it can be concluded that the case method is a learning approach that involves analyzing real situations to find relevant solutions. This method is designed to develop critical thinking, analytical, and problem-solving skills. In microteaching, the case method can be used to simulate real classroom situations, such as managing students with special needs or dealing with discipline problems in the classroom.

Team-Based Project

A team-based project is a collaborative learning approach in which students work in groups to complete a specific project. This method is designed to develop teamwork, communication, and project management skills. In the context of microteaching, a team-based project allows students to work together to design, implement, and evaluate teaching scenarios. This approach helps them understand the importance of teamwork in planning effective learning and solving classroom problems (Yusra, 2020).

In an effort to improve the quality of students to become a superior generation, they need to develop various skills, including problem solving, creative thinking, collaboration skills, and effective communication. The project-based learning model (PjBL) is seen as an approach that can support the development of these skills. Through this model, students can interact directly with the subject matter through projects related to real life, so that learning becomes more meaningful (Kusuma, 2021).

Therefore, teachers need to design learning that is in accordance with students' daily lives and encourage them to think scientifically. Effective learning planning is a major factor in the success of education in schools. With systematic planning, teachers can teach more focused, while students get optimal support in their learning process (Sari, 2017). According to Mukra et al. (2024), based on data analysis, it can be concluded that there is an influence of project-based learning concentration on learning outcomes.

Pjbl has been proven to be a practical and successful instrument for fostering pupils' capacity for creative thought (Prabawati et al., 2025). The project-based learning approach that works well for enhancing students' mental habits (Mardhatillah et al., 2025). In the use of project-based learning that is applicable to the business sector, with a particular emphasis on product development (Okterina et al., 2025).

Basic Teaching Skills

Basic teaching skills include fundamental abilities that must be possessed by prospective teachers, such as opening and closing lessons, providing feedback, asking questions, and managing the class. According to Arends (2012), basic teaching skills are core skills that must be mastered by teachers to create meaningful learning experiences for students.

Basic teaching skills include various aspects of abilities that must be possessed by teachers in carrying out their duties. These skills are closely related to efforts to provide stimulation and motivation to students to be involved in learning activities. As educators, teachers are responsible for guiding, directing, and building student understanding in the learning process, so that the educational goals that have been set can be achieved comprehensively and in an integrated manner (Wahyulestari, 2018).

Furthermore, research conducted by Agustina et al. (2017), concluded that the achievement score of basic teaching skills in the microteaching course increased in both teaching practice displays. Basic teaching skills are an important aspect that must be possessed and mastered by a teacher before carrying out the learning process.

Both static manifestations and dynamic processes of the emotional experiences of volunteer educators. Two recurring themes that called for more assistance within rural voluntary teaching groups were "actively regulating emotions" and "passively being regulated." This is a skill that is needed by an educator (Zhang et al., 2025).

In order to assist the development of their fundamental teaching abilities, the participants valued the planning and consultation stages, the teaching practice, peer observation, and observer comments from the reflection phase (Jayanti et al., 2023).

Similarly, the results of the study of Bi et al. (2024), Four cognitive strategies (memory, inference and elaboration, retrieval, and comprehension) and three metacognitive strategies (planning, monitoring, and assessing) were shown to be processes pertinent to the notion in this study.

Other abilities is modified design-based learning strategies provide insightful information for improving teacher education programs' ability to assist educators in successfully incorporating technology into their lesson plans (Junhong et al., 2025).

According to Sundari et al. (2017), these skills are specific and must be possessed by educators, including teachers, lecturers, and instructors, in order to teach effectively, efficiently, and professionally. As prospective educators, students need to be well prepared through various learning programs and activities, both on and off campus. In addition, students must also continue to learn and practice continuously so that basic teaching skills can develop optimally.

Communication Skills

Communication skills are an important aspect of the teaching profession. These skills include verbal and

non-verbal abilities to convey information in an interesting, clear, and easily understood way by students. According to Hargie (2011), communication skills in education include the ability to listen actively, explain concepts simply, and build positive relationships with students. Microteaching provides opportunities for prospective teachers to practice their communication skills through teaching simulations.

Students are learners who are prepared to become professional teachers. As prospective educators, they need to master the concept of knowledge and teaching skills. In addition, students are also expected to have various supporting skills, such as collaboration and communication, as provisions in carrying out teaching duties in the future (Prasetyo et al., 2023). According to Hamidah et al. (2022), the lack of fluency in communication in prospective teachers can be one of the factors that causes misconceptions in learning biology material.

This theoretical review shows that microteaching, case method, and team-based project complement each other in improving students' basic teaching and communication skills. The use of this approach-based guidebook can help prospective biology teachers at UNIMED to overcome learning challenges and prepare them to become professional educators.

The essay emphasizes how supported teaching in school (STS) gives student teachers useful skills, boosts their self-esteem and communication abilities, encourages creativity by varying teaching approaches, and fosters positive relationships between students, instructors, and the community (Bour et al., 2025).

The study's findings demonstrated (i) the essential assessment standards that were found to be essential for creating high-quality immersive experiences, (ii) the value of the rubric developed to make the prototypes' pilot testing easier, and (iii) the difficulties (Lazou et al., 2025).

Likewise, with the results of the study of Lubis et al. (2020), As students' learning achievements increased, so did their microteaching learning. This was evident in the subsequent semester's field practice scores, which rose while the students' total scores remained extremely good.

Method

This study uses the Plomp development design consisting of three stages, namely analysis, development, and evaluation. This model was chosen because it provides a systematic framework for designing and developing educational products, in this case microteaching books.

The subjects in this study consisted of two main groups. First, 30 UNIMED biology education students who were taking microteaching courses were selected as trial participants. Sample selection was carried out using a purposive sampling technique to ensure that the subjects were directly related to the research topic. Second, there are 3 lecturers of microteaching: As expert validators to assess the feasibility of the content/design of the book.

The research procedure is divided into three stages, namely: Analysis: Analysis of needs through the curriculum at the university, preparation of book drafts, assessment sheets, response sheets, observation sheets for teaching and communication skills, development: Validation of textbook prototypes to experts (lecturers), Distribution of textbooks to students, microteaching lectures using textbook prototypes, distribution of response questionnaires, observation of basic teaching and communication skills in student teaching practices; and evaluation: managing the data obtained, analyzing the data, and compiling a research report.

The instruments used in this study include: (1) Interview Guide: Contains a list of questions related to students' and lecturers' needs for microteaching learning. (2) Observation Sheet: Measures students' basic teaching and communication skills during teaching simulations. (3) Feedback Questionnaire: Contains statements that measure students' perceptions of the effectiveness of the book. (4) Expert Validation Rubric: Assesses the quality of the content, language, and design of the book.

Data analysis from expert validation and response questionnaires was analyzed using descriptive statistics (percentage and average) to assess the validity and practicality of the book. Data from the observation sheet were analyzed using a Paired samples t-test with a significance of <0.05.

With this research method, it is hoped that the microteaching book based on the case method and team-based project can meet the needs of UNIMED Biology Education students, while also providing a real contribution to the development of the competence of prospective biology teachers.

Result and Discussion

Product Validity

Product validation was conducted by three experts in the field of education. Assessing the validity of the product in terms of content, appearance, and availability of case method and team-based project assignments. The results of the book's validity can be seen in Table 1. The validity results show that the microteaching book is in the very valid category. This means that there is a match between the content, appearance and assignments in the product with the textbook standards.

Table 1. Product Validity

Description	Score	Value	Category
The material is presented conceptually	3.60	91.60	Very valid
and the achievement of learning objectives.	3.60	91.60	Very valid
The suitability of the material to the level of development of students (Students)	4.00	100.00	Very valid
The concept of the material is in accordance with the scientific aspects	3.30	83.30	Valid
Examples of material with conditions in the surrounding environment	3.30	83.30	Valid
The material in the textbook is accompanied by clear examples	4.00	100.00	Very valid
The book is presented according to the needs of students in the lecture process	4.00	100.00	Very valid
The book is presented using language that is easy to understand for the student level	4.00	100.00	Very valid
Book features such as images, tables, and barcodes support students in understanding the material	3.60	91.60	Very valid
The book contains case method assignments that help develop students' critical thinking	3.60	91.60	Very valid
Total	37	933	
Average	3.70	93.30	Very valid
SD		6.59	

Product Practicality

Student responses to the developed microteaching book were conducted by 30 participants. Biology Education students responded to the product from the aspects of material content, book appearance, and assignments in the book. The results obtained were that students responded well to the microteaching textbook. The detailed results of student responses can be seen in Table 2.

Table 2. Biology Education Students' Responses to Books

Description	Score	Value	Category
The cover display is attractive according to the title of the book	3.200	80.12	Good
The writing is clear and easy to read, the pictures and tables are clear	3.23	80.76	Good
The size of the book is appropriate and easy to use and carry around	3.56	89.10	Very good
The appearance of the book can motivate readers to be interested in studying it	3.23	80.76	Good
The topic of discussion/chapter title attracts your attention to learn more	3.41	85.25	Good
The material in the book is in accordance with the RPS	3.30	82.69	Good
The material is presented clearly and in easy-to-understand language.	3.30	82.69	Good
The material contains information needed in microteaching practice.	3.46	86.53	Very good
The book contains a table of contents, a list of pictures, and a list of tables.	3.48	87.17	Very good
The book contains case method assignments according to the applicable curriculum	3	76.92	Good
The book contains team-based project assignments according to the applicable curriculum	3	76.92	Good
The barcode on the book can be accessed and is easy to apply	3,3	82,69	Good
Total	39.47	991.60	
Average	3.28	82.63	Good
SD		3.85	

Product Effectiveness

Product effectiveness is seen from the achievement of basic teaching skills and communication skills of students before and after using the microteaching book that has been developed based on the case method and team-based project. This achievement is seen by comparing student practice data before and after being given the microteaching book.

Table 3. Results of the Significance Test of Differences in Pre-test and Post-test Basic Teaching Skills

Paired sample test								
	Paired differences					t	df	Sig (2-taled)
	Mean	Std. deviation	Std. Error mean	95% Confidence interval of the difference				
				Lower	Upper			
Pair 1 Pre teaching basic-post teaching basic	-19.60	11.80	2.15	-24.00	-15.19	-9.09	29	0.00

Basic teaching skills of Biology Education students using microteaching books: the results of the Paired Sample T-Test showed a significant difference between the Pre-Teaching Basic and Post-Teaching Basic values ($p = 0.000$, $t = -9.092$). Thus, the basic teaching intervention has a positive and significant impact on improving the basic teaching skills of Biology Education students. The results of the paired sample t-test for the

effectiveness of the book on basic teaching skills can be seen in Table 3.

There is a significant difference between the pretest and posttest of basic teaching skills of biology education students with a significance level (2-tailed) <0.05. The case method in microteaching places biology education students in real case situations that must be analyzed and resolved reflectively. This helps students understand the complexity of teaching and develop classroom management and communication skills. That the module's use demonstrates how well it works to raise pupils' literacy levels. in order for the regional potential-based teaching module to be legitimate, useful, and successful in raising students' literacy levels in biodiversity-related content (Lasih et al., 2025).

That learning outcomes and students' capacity to create research proposals are impacted by the use of findings from research, teaching approaches, and the creation of instructional materials (Ihsan HL et al., 2025).

Likewise, the results of research by Sipayung et al. (Sipayung et al., 2024) state that improving teacher communication skills through the use of the Case Method or Problem Based Learning (PBL) can be done in several ways. PBL directs teachers and students to solve problems through discussions, presentations, and classroom action research. In discussions, teachers can train students to communicate actively and share ideas, so that teachers can also improve their own communication skills.

PBL also allows teachers to analyze data and improve their communication skills through reflection and evaluation. Finding of Chaniago et al. (2025), that show that in order to promote more effective learning, teaching techniques (Pbl) must be in line with students' learning preferences. The designed project-based learning integrated modules are legitimate, useful, and efficient in raising learning results (Deliana et al., 2025). It was feasible and efficient to apply the flipped classroom learning approach to create an e-module for problem-based learning (PBL) (Dewi et al., 2024).

Microteaching in Service Learning adopts the Problem-Based Service learning approach, where students carry out teaching practices based on the problems they face. This approach has proven effective, as shown by the positive response from students and the increasing understanding of biology education students regarding the concept of Microteaching, which is integrated into direct teaching experiences (Sholichah, 2019). According to Şahin et al. (2020), the microteaching learning model can develop teacher professionalism in multifaceted thinking, problem solving, self-confidence, and patience in dealing with students, and preparing learning plans.

Meanwhile, the team-based project method encourages prospective teachers to work together in small teams to design, implement, and evaluate teaching. Liu et al. (2017) stated that team-based projects are effective in improving basic teaching skills because prospective teachers learn through direct experience and collaboration between team members. In addition, this approach improves the ability to provide constructive feedback which is important in teaching reflection.

According to Nurazmi (2020), learning with the case method and team-based project has the main characteristics, namely involving students in facing real problems, finding solutions, and working in small groups. In the process, students not only gain an understanding of the context of the problem, but also develop various other skills, such as communication and critical thinking.

According to Sahertian et al. (2022), the application of the case method and team-based project methods has proven effective in providing opportunities for students to develop various skills, such as communication and skills, and in the preparation of Semester Learning Plans (RPS) based on the case method and team-based projects, lecturers' understanding needs to be improved so that the designed assignments can be delivered effectively to students. Furthermore, according to (Nasir et al. (2022), there are certain requirements that must be met by lecturers in designing learning plans with this approach.

Communication skills of Biology Education students: the results of the Paired Sample T-Test showed a significant difference between the Pre-Test (Comm_PRE) and Post-Test (Comm_POST) scores with an average difference of 15.1 points (p = 0.000). This proves that the intervention carried out is effective in improving learning outcomes or communication skills of participants.

Table 4. Results of the Significance Test of Differences in Pretest and Posttest Communication Skills

	Paired sample test							
	Paired differences							
	Mean	Std. deviation	Std. Error mean	95% Confidence interval of the difference		t	df	Sig (2-taled)
				Lower	Upper			
Pair 1 comm_pre-comm_post	-15.10	12.40	2.26	-19.73	-10.46	-6.66	29	0.00

There is a significant difference between the pretest and posttest of the communication skills of biology education study program students with a significance level (2-tailed) < 0.05. Communication skills are important skills in education and professional world. Case method and team-based project books are effective because: 1) Encourage Active Interaction: Students are involved in discussions, presentations, and reflections that encourage verbal and non-verbal communication; 2) Sharpen Critical Thinking Skills: Case solving encourages participants to analyze problems in depth and communicate solutions effectively; and 3) Collaborate in Teams: Through group work, participants learn to listen, convey ideas, and build effective two-way communication.

Prospective biology teachers who have effective communication skills have survival competencies. This means the competencies needed to face life, the world of work, and citizenship in the 21st century (Magfirah et al., 2024). Lufri et al. (2021) shows that Problem-Based Learning (PBL) significantly improves students' communication skills, with the PBL learning model also being able to improve students' achievement and communication skills (Oktaviani, 2022). Likewise, it can improve intrapersonal skills, which means there is a strengthening in communication and group work skills (Rendón-Castrillón et al., 2023).

Conclusion

The design of Microteaching textbooks based on case method and team based project to improve basic teaching and communication skills of students of biology education study program at Unimed is in the category of Very Valid, Good practicality of the book, and effectiveness on basic teaching skills and effective communication. The effectiveness of the design of Microteaching textbooks based on case method and team based project to improve basic teaching and communication skills of students of biology education study program at Unimed is effective because it shows a difference in initial value (before using the book) with the final value.

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