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Profile of Basic Teaching Skills of Prospective Biology Teachers: A Video-Based Longitudinal Study in a Microteaching Course (2020–2023)

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Abstract: This video-based longitudinal study is the first in Papua to describe the profiles of eight basic teaching skills of prospective biology teachers who took the Microteaching course from 2020 to 2023. The study was conducted at the Biology Education Program, Faculty of Teacher Training and Education, Cenderawasih University, from April to May 2024. The population in this study consisted of 180 sixth-semester students enrolled in the Microteaching course, with a random sample of 45 students (25%) selected. Data collection techniques utilized an observation sheet for basic teaching skills. The results indicated that, on average, the basic teaching skill scores of prospective biology teachers were 62.47 (± 6.61), falling into the "adequate" category. Longitudinal studies provide authentic data that can also be used to measure various classroom learning activities.

Keywords: Basic teaching skills; Longitudinal study; Microteaching; Prospective biology teachers

Introduction

The Biology Education Study Program as part of the Teacher Education Institution (LPTK) has the duties and responsibilities to educate and produce prospective biology teachers who are competent to serve as teachers in Indonesia, particularly in Papua Province. Competent teachers, according to Law No. 14 of 2005, are required to master four competencies, namely pedagogical, professional, social, and personal competencies. The lecture process at LPTKs is directed toward the mastery of competencies stipulated by law through a series of courses from Semester I to Semester VIII. Microteaching is one of the compulsory courses in the Biology Education Study Program, taught in Semester VI, and serves as a practical course to train students' basic teaching skills before they undertake the Field Experience Program (PPL) in schools in the following semester.

Basic teaching skills constitute a series of skills that must be possessed by teachers through training and practice as preparation for conducting classroom instruction (Karacaoğlu, 2025; König et al., 2024; Matsumoto-Royo et al., 2021). Basic teaching skills are viewed as a set of competencies trained through microteaching to develop teachers' abilities (Grunke et al., 2019; O'Flaherty et al., 2023; Savaş, 2019; Sugihartini et al., 2025; Tülüce et al., 2018). According to Turney as cited in Hawa et al. (2022), there are eight basic teaching skills that must be mastered by prospective teachers, namely skills in opening and closing lessons, explaining skills, questioning skills, reinforcement skills, variation skills, skills in guiding small group discussions, and classroom management skills.

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Teachers who have a good work ethic must also possess teaching skills in order to achieve the learning objectives stated in the applicable curriculum (Darling-Hammond et al., 2020; Gultom et al., 2020; Hattie, 2023; OECD, 2019). The study by Gravett et al. (2023) highlights the importance of equipping prospective teachers at universities with basic teaching skills through instructional practice to produce them as professional teachers. To face the challenges of the 21st century, it is important to equip teachers with adequate basic teaching skills (Caena et al., 2019; Gravett et al., 2023; Häkkinen, 2013; Zamora et al., 2022). One way to improve basic teaching skills is through feedback and discussion among prospective teachers during teaching practice (Erdemir et al., 2021; Indrawati, 2011; Wang et al., 2025; Xu et al., 2025).

Video-based longitudinal studies have been conducted in several regions in Indonesia; however, there has been no similar research conducted in Papua in general, and specifically there is no information regarding the profile of basic teaching skills of prospective biology teachers at the Faculty of Teacher Training and Education (FKIP), Universitas Cenderawasih. Therefore, the researchers are interested in examining this aspect. This study aims to describe the profile of eight basic teaching skills of prospective biology teacher students who participated in the Microteaching course during the years 2020–2023. The results of this study are expected to serve as data and information for the development and improvement of the Microteaching course.

Method

This study employed a quantitative descriptive design with a video-based longitudinal study approach aimed at describing the profile of eight basic teaching skills of prospective biology teacher students. Research using a video-based approach represents authentic practice and reduces complexity, providing opportunities for prospective teachers to acquire practice-oriented knowledge (Codreanu et al., 2020). This study was conducted in the Biology Education Study Program, Faculty of Teacher Training and Education (FKIP), Universitas Cenderawasih, from June to August 2024. The population of this study consisted of sixth-semester students who took the Microteaching course during the period 2020–2023, totaling 180 students. The sample was selected using cluster random sampling, consisting of 45 students (25%). Data collection techniques used an observation sheet of basic teaching skills. The indicators for measuring basic teaching skills are described in the Table 1.

The data analysis technique for data obtained from the basic teaching skills observation sheet was calculated using a scoring formula (Artama et al., 2023) as follows:

$$N = \frac{score\ obtained}{maximum\ score} X\ 100 \quad (1)$$

Description: N is the score achieved; 100 is a constant value.

The data analysis technique for data obtained from the basic teaching skills observation sheet was calculated using a scoring formula (Artama et al., 2023) as describe in the Table 2. The observation sheet instrument was validated by three experts prior to use, and the results indicated that it was valid with an Aiken's V index value of 0.90 and reliable with an Intraclass Correlation Coefficient value of 0.79; therefore, it was suitable for data collection. The results of the validity and reliability tests are presented in Table 3 and Table 4 as follows.

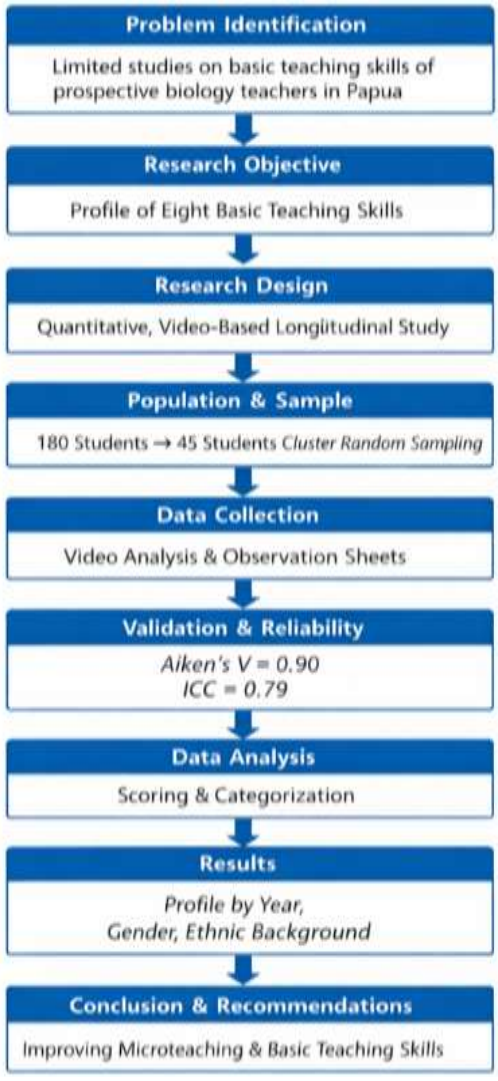

Figure 1. Research flowchart

Table 1. Variables, Sub-Variables, and Indicators of Basic Teaching Skills

Variable	Sub-Variable	Indicators
Basic Teaching Skills	Skills in Opening and Closing Lessons	Focusing students' attention and classroom readiness
		Stimulating interest and motivation
		Providing orientation
		Reviewing
		Evaluating
	Explaining Skills	Planning explanations
		Delivering explanations
	Questioning Skills	Basic questioning
		Advanced questioning
	Variation Skills	Variation in teaching style
		Variation in the use of instructional media
		Variation in student interaction patterns
	Reinforcement Skills	Verbal reinforcement
		Non-verbal reinforcement
	Classroom Management Skills	Creating and maintaining optimal learning conditions
		Controlling optimal learning conditions
		Avoiding actions that have negative impacts
	Small Group and Individual Teaching Skills	Making personal approaches to students
		Organizing and guiding students
		Planning and implementing teaching and learning activities
	Small Group Discussion Guiding Skills	Focusing students' attention
		Clarifying problems and analyzing students' opinions/views
		Distributing opportunities for participation
		Closing the discussion

Table 2. Categories of Basic Teaching Skills Scores

Score Range	Category
> 80	Very Good
71–80	Good
60–70	Fairly Good
< 60	Poor

Table 3. Results of the Validity Test of the Observation Sheet Instrument

Number of Items	Rater			S1	S2	S3	∑S	n (C-1)	Validity	Remarks
	I	II	III							
6	24	22	21	18	16	15	49	54	0.90	Valid

Table 4. Results of the Reliability Test of the Observation Sheet Instrument

Alpha Value	Significance	Intraclass Correlation Coefficient	Remarks
0.81	0.01	0.79	Reliable

Result and Discussion

The results of the longitudinal study through video analysis of the teaching practices of prospective biology teachers in the Microteaching course during the period 2020–2023 are described as follows.

Profile of the Basic Teaching Skills of Prospective Biology Teachers in 2020–2023

The data on the profile of basic teaching skills of prospective biology teachers in general during the period 2020–2023 are presented in Table 5.

Table 5. Profile of Basic Teaching Skills of Prospective Biology Teachers in 2020–2023

Basic Teaching Skills	2020 Sample	2020 Score	2021 Sample	2021 Score	2022 Sample	2022 Score	2023 Sample	2023 Score	Total Sample	Mean Score	Category
Opening and Closing Lesson Skills	12	68.05	11	62.90	12	65.10	10	65.58	45	65.40	Fair
Explaining Skills	12	55.00	11	56.00	12	56.00	10	57.00	45	56.00	Poor
Questioning Skills	12	58.80	11	57.90	12	56.50	10	62.25	45	58.86	Poor

Basic Teaching Skills	2020 Sample	2020 Score	2021 Sample	2021 Score	2022 Sample	2022 Score	2023 Sample	2023 Score	Total Sample	Mean Score	Category
Classroom Management Skills	12	54.00	11	50.15	12	52.00	10	52.05	45	52.05	Poor
Reinforcement Skills	12	70.00	11	66.10	12	68.00	10	68.26	45	68.09	Fair
Variation Skills	12	64.04	11	60.30	12	61.90	10	62.00	45	62.06	Fair
Small Group Discussion Guiding Skills	12	70.00	11	74.00	12	72.50	10	72.50	45	72.25	Good
Small Group and Individual Teaching Skills	12	65.00	11	68.70	12	62.50	10	64.00	45	65.05	Fair
Mean		63.11		62.00		61.81		62.80		62.47	Fair
Standard Deviation										6.61	

Based on the data from the analysis presented in Table 5, it is generally known that there are no differences in the basic teaching skills of prospective biology teachers based on the year of implementation over the four years of the Microteaching course from 2020 to 2023. When viewed from each aspect of the eight basic teaching skills, there are three basic teaching skills that are still insufficient or low, namely explaining skills, questioning skills, and classroom management skills.

Profile of Basic Teaching Skills Based on Gender

The data on the profile of basic teaching skills of prospective biology teachers based on gender during the period 2020–2023 are presented in Table 6 as follows.

Table 6. Profile of Basic Teaching Skills Based on Gender

Basic Teaching Skills	Gender	Sample	Score	Category
Opening and Closing Lesson Skills	Male	20	62.50	Fair
	Female	25	68.30	Fair
Explaining Skills	Male	20	52.00	Poor
	Female	25	60.00	Fair
Questioning Skills	Male	20	57.72	Poor
	Female	25	60.00	Fair
Classroom Management Skills	Male	20	52.00	Poor
	Female	25	52.10	Poor
Reinforcement Skills	Male	20	68.04	Fair
	Female	25	68.15	Fair
Variation Skills	Male	20	60.12	Fair
	Female	25	64.00	Fair
Small Group Discussion Guiding Skills	Male	20	70.00	Good
	Female	25	74.50	Good
Small Group and Individual Teaching Skills	Male	20	64.00	Fair
	Female	25	66.01	Fair

Based on the data presented in Table 6, the profile of basic teaching skills based on gender shows that the percentage of female prospective teachers has slightly better basic teaching skills compared to male prospective teachers.

Profile of Basic Teaching Skills Based on Ethnic Background

The data on the profile of basic teaching skills of prospective biology teachers based on ethnic background during the period 2020–2023 are presented in Table 7. The data presented in Table 7 show that, in general, when viewed from ethnic background, prospective teachers from non-Papuan ethnic groups have slightly better basic teaching skills profiles compared to prospective teachers from Papuan ethnic groups.

Based on the results of the analysis of observation data on the basic teaching skills of 45 prospective biology teacher students presented in Table 1 above, an overall mean score of basic teaching skills of 62.47 was obtained, which falls into the fair category. The lack of explaining skills is clearly evident as students did not provide emphasis on certain important parts of the material and the examples and illustrations given were not yet relevant to the topic being taught. This condition may occur because students do not optimally master the learning material or topic. Similar findings were reported by Rhamayanti (2018), who stated that the lack of explaining skills among prospective teacher students was due to insufficient understanding of the material to be taught, feelings of awkwardness when teaching in front of the class, fear of not receiving good responses to the material taught, and not knowing the sequence of the

material delivery process. Findeisen et al. (2023) found that prospective teachers experience difficulties in presenting and explaining material effectively in the form of verbal information delivery, visual representations, providing examples, and using analogies.

Table 7. Profile of Basic Teaching Skills Based on Ethnic Background

Basic Teaching Skills	Ethnic Background	Sample	Score	Category
Opening and Closing Lesson Skills	Papuan	22	60.00	Fair
	Non-Papuan	23	70.80	Good
Explaining Skills	Papuan	22	54.00	Poor
	Non-Papuan	23	58.00	Poor
Questioning Skills	Papuan	22	57.00	Poor
	Non-Papuan	23	60.72	Fair
Classroom Management Skills	Papuan	22	50.05	Poor
	Non-Papuan	23	54.05	Poor
Reinforcement Skills	Papuan	22	68.68	Fair
	Non-Papuan	23	67.50	Fair
Variation Skills	Papuan	22	60.12	Fair
	Non-Papuan	23	64.00	Fair
Small Group Discussion Guiding Skills	Papuan	22	72.25	Good
	Non-Papuan	23	72.25	Good
Small Group and Individual Teaching Skills	Papuan	22	65.10	Fair
	Non-Papuan	23	65.00	Fair

In addition, the questioning skills of prospective biology teacher students are also still low because they have not been able to provide questions that lead to critical thinking skills and are limited to comprehension-level questions. They are also not yet able to provide reinforcement of students' answers and distribute questions evenly to the entire class. Furthermore, Nugraha et al. (2023) stated that the lack of questioning skills occurs because teachers need to train and deepen several aspects, namely providing students with opportunities to think, giving cues, focusing attention, and providing guidance. There are four high-quality questioning practices according to Joseph et al. (2020), Thomas (2020) and Walsh et al. (2015): (1) questions should be structured to focus on initiating and sustaining students' thinking and interaction, (2) encouraging equitable active student participation to ensure that students are responsible for formulating responses and playing roles during discussions, (3) organizing student comments to sustain and deepen thinking and understanding, and (4) fostering a classroom culture that supports thoughtful and respectful discourse. Hariyadi (2014) also revealed that questioning skills are very important in teaching and learning interactions as they can enhance students' creativity and provide opportunities for teachers to create an interactive learning atmosphere so that students dare to ask questions.

Classroom management skills are the skills with the lowest achievement scores among prospective biology teacher students. The lack of classroom management skills is evident from their lack of responsiveness to classroom situations, insufficient ability to focus students' attention on listening to the delivery of material, failure to reprimand students who are playing or engaging in other activities, and the presence of lengthy and unclear instructions. The lack of classroom management skills may also be caused by the inability of prospective teachers to apply theoretical knowledge and manage student behavior in the classroom (McGarr, 2020; Muliyadi et al., 2023; Munandar et al., 2024). The results of the study by Mugot et al. (2019) also stated that prospective teachers consider classroom management skills as the weakest basic teaching skill. The importance of classroom management in learning lies in improving the learning environment and enhancing students' learning capacity (Emmer et al., 2013; Evertson et al., 2015; Kumar et al., 2019; Sullivan et al., 2021).

The findings on basic teaching skills of prospective teachers based on gender show that female prospective teachers are slightly better than male prospective teachers. Male prospective teachers are weaker in explaining skills, questioning skills, and classroom management skills, whereas female prospective teachers appear to be lacking only in classroom management skills. In general, based on basic teaching skills scores, no striking differences were found between female and male prospective teachers. The results of this study are in line with the findings of Igberadja (2016), who revealed that gender and teacher qualifications have no relationship with student performance. Antika et al. (2019) also found that there were no significant differences in basic teaching skills between male and female prospective teachers.

Based on ethnic background, the findings of this study also generally show no significant differences

between prospective teachers from Papuan and non-Papuan ethnic groups. Non-Papuan prospective teachers obtained a good category in opening and closing lesson skills because they prepared themselves better and were more confident in appearing in front of the class. For other basic teaching skills, the findings do not appear to differ significantly, although non-Papuan teachers are slightly better. Previous research findings indicate that teachers' and children's race/ethnicity may be important in the classroom because it influences how teachers perceive children and vice versa, and that racial/ethnic alignment between children and their teachers can provide culturally relevant role models for children and create a warmer learning environment (Blake et al., 2016; Cherng et al., 2016; Egalite et al., 2018; Rasheed et al., 2020).

The development of basic teaching skills is an important effort to address students' learning needs in the 21st century (Martinez, 2022). Furthermore, according to Zamora et al. (2022), basic teaching skills are essential to be equipped to prospective teachers in order to face the challenges of the 21st century. The study by Gravett et al. (2023) also stated the same, emphasizing the importance of equipping prospective teachers at universities with basic teaching skills through teaching practice activities to foster their professionalism as teachers.

Conclusion

The findings of the study indicate that, in general, the average score of basic teaching skills of prospective biology teacher students during the period 2020–2023 falls into the fair category. The basic teaching skills of prospective teachers based on gender and ethnic background do not show significant differences. This study is limited to examining the profile of basic teaching skills of prospective biology teachers and does not yet cover other scientific disciplines. The results of this study serve as a reference for further research to improve and develop the basic teaching skills of prospective teachers, particularly those skills that are still lacking, namely questioning skills, explaining skills, and classroom management skills.

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M.A.: methodology, M.A, S.H.: validation, formal analysis, M.A, S.H.: investigation, I.: resources, data curation, M.A, S.H writing—original draft preparation, M.A: writing—review and editing, I, C: visualization, supervision, project administration.

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The authors declare no conflict of interest.

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