



Analysis of Professionalism and Personality Competencies of Physics Teacher Candidates Through Laboratory Assistance Program

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Abstract

The role of teachers in the educational process requires adequate professional qualifications to carry out their duties and responsibilities effectively. Standards for academic qualifications and teacher competency are regulated nationally, with personality and professional competency being the most significant. Students as prospective teachers need to have these qualification standards. This study aims to examine the professionalism and personality competencies of prospective physics teachers through a laboratory assistance program. A qualitative approach with a collective case study design was used to analyze data from 8 physics education students participating in the program. The results show that this program helps physics education students develop professional competence through problem-solving processes during laboratory activities. Meanwhile, personality competence is formed through self-control awareness and the development of student character. Thus, the laboratory assistance program has proven to be effective in preparing physics education students with the necessary competencies to become quality teachers.

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1. Introduction

Teachers play an important role in the educational process, so they must have professional qualifications to develop them and carry out their duties and roles. The Minister of National Education Regulation Number 16 of 2007 concerning Academic Qualification Standards and Teacher Competencies, regulates the academic qualification standards that must be met by a teacher along with the competencies that must be possessed. These academic qualifications and teacher competencies are nationally applied, namely pedagogical competence, personality competence, social competence and professional competence [1]. Among the four competencies of teachers that have a significant influence on the quality of teachers are personality competence and professional competence. This is in line with research findings [2]–[4] which explain that personality competence has a significant effect on teacher quality and professional competence significantly influences teacher performance quality [5],[6]. This article will discuss personality competence and professional competence without neglecting the essence of pedagogical competence and social competence.

Professional competence is the ability to master the knowledge and skills of a teacher in carrying out their duties and responsibilities [7],[8]. The importance of a teacher's professional competence will affect the learning process, which will have an impact on student's motivation to learn and achieve.

Good professional competence of teachers will produce quality learning and impact students' learning achievements [7]–[9]. Meanwhile, personality competence refers to the characteristics and personal values possessed by teachers. Ideally, a teacher should reflect a steady personality competence and be a role model for students [10],[11].

Teacher personality competence expressed in behavior will affect students' behavior and the teaching-learning process. Therefore, both competencies must be possessed by a teacher to teach and educate effectively. Professional competencies based on Permendiknas no. 16 of 2007, each have their respective indicators, including: (1) Mastering the subject matter, structure, concepts, and scientific mindset that support the subjects taught; (2) Mastering the competency standards and basic competencies of the subjects taught; (3) Creatively develop learning subjects that are taught; (4) Continuously developing professionalism through reflective actions; (5) Utilize information and communication technology for self-development. Meanwhile, personal competencies based on SNP no. 15 of 2005, each have their respective indicators, including: (1) steady, (2) stability, (3) maturity, (4) wisdom and sagacity, (5) authoritative, (6) have noble characters, (6) being a role model for students and the community, (7) evaluate own performance, and (9) continuous self-development.

Many issues exist within the realm of education, one of which is the lack of competence among teachers in carrying out their duties. This aligns with research [12] that explains several teachers who teach subjects unrelated to their educational background, and teachers have yet to master information and communication technology, especially in remote areas [8]. Besides professionalism, teachers with good and commendable personalities will have a positive impact on students, and vice versa. Teachers are expected to set an example of discipline, responsibility, wisdom, and commendable behavior to students [13]–[15]. Teachers who are unable to manage their emotions and resolve conflicts effectively can create a non-conducive learning environment for students [16],[17]. Therefore, professional and personality competencies need to be developed since studying as prospective teachers.

One way to improve the professionalism and personality competence of physics education students is by gaining experience through participating in extracurricular programs conducted during their studies, such as microteaching and teaching assistance. Teaching assistance program have a role in enhancing personality competence by training prospective teachers to have noble character according to the norms both in schools and the surrounding community [18],[19] as well as improving professional competence through classroom teaching practice [20]. Previous research has also suggested that microteaching can enhance professional competence as prospective teachers can practice lesson planning, deepen conceptual teaching, and learn how to teach to smaller groups of students, thus also enhancing personality competence by instilling confidence in adhering to norms and the teacher's code of ethics [21],[22]. As physics education students, another experience to develop their competencies is through laboratory assistance program.

By participating in the laboratory assistance program, physics education students can improve their abilities in subject matter, conceptual structure, and theory validation in a practical experiment subject [12]. The laboratory assistant program can also shape the personality of physics education students in terms of responsibility, knowledge construction, mastery of skills, and other personality traits [23]. However, previous research did not delve deeper into teacher competencies, especially professionalism competency and personality competency. Thus, this study aims to discuss the levels of professionalism and personality competence of physics education students through the physics laboratory assistance program. Hopefully, the analysis of this study can provide insights into the details of the laboratory assistance experience towards the formation of professionalism competencies and personality competencies to support their transformation as prospective physics teachers.

2. Methods

This study aims to assess the preparation of prospective physics teachers based on competency standards on professionalism competence and personality competence through the laboratory assistant program. The approach used in this research is a qualitative approach using a collective case study design to examine behavior, perceptions, motivations, actions, and experiences holistically to their meanings using a theoretical basis [24]. In this study, each personality competence and professionalism competence of physics education students as prospective physics teachers were evaluated relative to their experience in the laboratory assistant program.

The research was carried out at the Department of Physics, State University of Malang in the odd semester of the 2023/2024 academic year. The research scope includes physics education students who are currently participating in the laboratory assistant program. The focus participants in this research were 8 students who assisted the implementation of different practicums including Practicums in Electronics I, Electronics II, Fundamental of Physics II, Fundamental of Physics III, and Electromagnetics. The eight participants are students who have or are currently participating in more than two laboratory assistance programs. These participants will be analyzed with the focus on professionalism and personality competence formed through laboratory assistance program experience.

In examining the formation of personality competence and professionalism competence through the laboratory assistant program, the data collection process is carried out through the distribution of open questionnaires as primary data and in-depth interviews as secondary data. Laboratory assistants are given questions through an open questionnaire adapted through Ministerial Regulation No. 16 of 2007 concerning teacher competency qualifications based on teacher professional competency standards that have been developed and validated as a final project [25]. In-depth interviews were conducted to gain a deeper understanding of their experiences in participating in laboratory assistance. The interview questions focused on the same instrument as the open-ended questionnaire questions, so to find out what they have developed through the laboratory assistance program. Some questions were adapted to the interviewees' specific responses to elaborate on their questionnaire answers. The interview instrument is shown in Table 1.

Table 1. Interview Questions Guide

No	Questions
1	<i>Should understanding of the material be a consideration in applying to be a laboratory assistant? Is there any special preparation that you do for this?</i>
2	<i>How do you understand the practicum subject you have chosen?</i>
3	<i>Is there anything that you prepare before carrying out your duties as a laboratory assistant to assist practical students to collect data?</i>
4	<i>How do you identify and solve problems that can interfere with the practicum?</i>
5	<i>How do you give and receive criticism and suggestions while running the program?</i>
6	<i>What attitudes and behavior did you demonstrate while being a laboratory assistant?</i>
7	<i>What personality do you think a laboratory assistant should have?</i>
8	<i>How can you convince others that you are worthy of being an example of a good laboratory assistant?</i>

The validity of this research data was achieved through a credibility test using the triangulation method. This step was taken to increase the accuracy level of the research data results. Triangulation measures were carried out as data credibility testing through source triangulation techniques [24], [26].

By using the same technique, namely in-depth interviews, triangulation is carried out to practicum students who have been accompanied by laboratory assistants. The data that has been collected is analyzed through the results of open questionnaire responses and transcripts of interviews that have been conducted. Data analysis in the field is still temporary and will develop according to conditions in the field, while data analysis is carried out simultaneously with the data collection process. The components in the data analysis used are the interactive model which includes data collection, data reduction, data display, and conclusion as shown in Figure 1 [27].

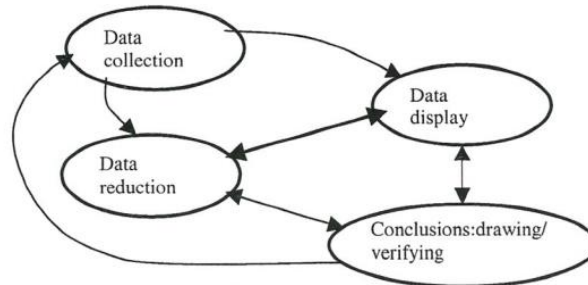


Figure 1. Research Flow

3. Results and Discussions

The results are obtained after a series of data analysis processes which are interpreted based on existing theories. Secondary data sources are the results of in-depth interviews which are then interpreted to get facts. In-depth interviews were conducted with 8 laboratory assistants of the Physics Department, State University of Malang. The following is a discussion of the existence of personality competence and professionalism in prospective physics teachers through the laboratory assistant program.

3.1. Professional Competency

Indicator 1. Mastery of Learning Materials

Many of the laboratory assistants received excellent grades. From the results of direct interviews with assistants, grade indexes were obtained which varied from B to A. Most laboratory assistants were not directly open about the grade indexes obtained.

“Yes, the grades obtained were good enough to apply as a laboratory assistant...” (EL)

Students also stated that by joining the laboratory assistant program, they understand the material better.

“I understand the material better by joining the laboratory assistant program than being a regular practicum student....” (AQ).

Accompanying an experiment requires a deep theoretical understanding of what will be done. This makes students realize the importance of mastering material in teaching and learning activities, especially as a teacher. From the results of the interviews obtained, it can be concluded that laboratory assistants have mastery of the material from the practicum course in which they are assigned. The awareness of mastery of this material is a provision for laboratory assistants who are prospective teachers in achieving comprehensive professionalism competencies.

Mastery of material is an important component in the learning process to achieve the set goals. In line with previous research, which explains that teachers must master the material before delivering it to students, if the teacher does not master it will have difficulty in delivering the material [28]. From the interviews with laboratory assistants, it was found that mastery of the material is a requirement to join the program.

The laboratory assistant program has a requirement to have completed the course to be registered with a good index. The value index is a marker that laboratory assistants have completed the study in the practicum course well, which means that students also have sufficient mastery of the material in the course.

Indicator 2. Developing Materials: Creative and Innovative

The laboratory assistant program turns students into creative and innovative individuals. In an interview with one of the students AQ, said that it is necessary to develop more appropriate material or experimental steps because the guidelines in the module use language that is difficult to understand so that it takes too long.

"Yes, in solving the problem, of course it needs improvisation from the laboratory assistant, I solved it by changing the procedure..." (AQ).

In addition to AQ, CL also said that equipment problems require laboratory assistants to be more creative and innovative in finding solutions.

"Because the equipment has problems and cannot be replaced, so I try to continue with students while learning to solve problems..." (CL)

Apart from equipment problems, assistants are also faced with students who are less prepared and have difficulty understanding the theory. In resolving this, some assistants open consultation sessions with discussion of material that is easier to understand for students who are having difficulty. Before doing the practicum, most laboratory assistants prepare students with a pre-test and trial set of tools to overcome students who do not understand the material. As stated by NF in his interview

"Yes, every time we collect the data, there is always a pre-test to ensure that students understand, and at the beginning of the meeting there is an activity where students try the equipment themselves so that the practicum can run smoothly..." (NF)

The laboratory assistant program helps students practice dealing with the problems they will face while becoming teachers in the future. The existence of training in the ability to develop material is one indicator that the assistant program is able to improve professional competence in students. The ability to develop material in the context of being creative and innovative is needed in the learning process. The results of previous research show that there is a significant positive influence between learning innovation and teacher creativity on learning outcomes [7],[25]. The results of the interview showed that assistants experienced many obstacles in the practicum and assessment process. So, implementing the practicum requires creativity and innovation from laboratory assistants to overcome the obstacles that occur.

Indicator 3. Understand The Material Broadly and in Depth in Accordance With The Educational Unit Program Content Standards

By conducting interviews, the results obtained that laboratory assistants are required to understand the material thoroughly and in depth according to program standards, namely practicum modules. LL stated in her interview that every laboratory assistant is required to understand the entire practicum subject to support the running of the practicum optimally.

"Assistants need to understand the material in the module thoroughly so that they do not depend on laboratory staff during practicum".

LL also explained that this in-depth understanding helps laboratory assistants prepare themselves in dealing with critical questions and problems related to experimental concepts and procedures.

"Sometimes practicum students ask about the concept of the experiment, so we have to explain in detail according to the practicum module..." (LL)

The step taken by students to equip themselves before joining the laboratory assistant program is to re-understand the overall objectives, theories, procedures, and results of the experiment to be selected.

Students who take part in the laboratory assistant program have full awareness of the importance of understanding broad and in-depth material in accordance with the module that is used as a reference during practicum. The laboratory assistant program trains students to understand the material broadly and deeply in accordance with program standards in the form of experimental modules to explain the theory of the experiments carried out [30]. To be able to explain the theory and answer questions, laboratory assistants certainly need a deep understanding. As a teacher, of course, it is required to understand the material in depth according to the standard content of the education unit program in carrying out knowledge transfer or teaching activities [31].

Indicator 4. Develop Professionalism Sustainably by Taking Reflective Action

The results of interviews with students in the laboratory assistant program show the reflective activities carried out. Student CL stated that at the end of each practicum activity there is a reflective activity for laboratory assistants to discuss both performance and personality errors that occurred on that day.

"After our practicum activities, there is always an evaluation of the practicum activities carried out that day..."
(CL)

CL stated that all opinions expressed in reflective activities are taken into consideration for laboratory assistants to behave better in the next practicum.

"I am very open to criticism and suggestions, if there is criticism, I accept it for future actions..." (CL)

Many of the laboratory assistants are very open to criticism and suggestions for further practicum activities. In carrying out the learning process, reflective activities are certainly needed for both teachers and students. Reflective actions for teachers provide additional information about the success or failure of the learning process. Reflective action is very important to improve the quality of learning, reflective action can help teachers to increase self-awareness, understand the learning process, and develop effective learning strategies [32]–[34]. Reflective activities are also carried out by students in the laboratory assistant program. For assistants, reflective activities are needed to handle and prevent future mistakes that occur on that day.

Indicator 5. Utilize Information and Communication Technology to Develop Themselves

The results of research conducted on laboratory assistants found the use of technology that supports the laboratory assistant program. The laboratory assistant program uses technology to adapt to current developments. The technology used is communication media in the form of WhatsApp applications, Google Drive, Google Docs, Spreadsheets, and Google Forms. This technology is used optimally in assisting practicum activities. The use of Google Form is made automatic and with feedback, so that students get information if they have submitted a practicum report. The WhatsApp application is also used in terms of consultation and two-way communication. EL stated that WhatsApp is used for communication among lab assistants.

"Yes, we use whatsapp for communication among lab mates..." (EL)

AQ explained that in the process of collecting reports, everything is fully automated by utilizing the Spreadsheet and google form features.

"Later, a Google form will be used for students to collect their reports, I will evaluate it directly through a spreadsheet that has been filled with student collection data..." (AQ)

The laboratory assistant program utilizes information and communication technology to support its activities [35]. This is the same as what teachers must do during the learning process, namely by utilizing technology [36]. This characterizes the similarity of professionalism indicators from the laboratory assistant program and teachers in the learning process.

Table 2. Summary of Professionalism Competence Indicators With Themes From The Data

Mastery of learning materials	Grade index B- to A Study the material more deeply as an assistant
Developing materials: creative and innovative	Change the experimental procedure Conduct tool experiments with practicum students Do a pre-test
Understand the material broadly and in depth in accordance with the educational unit program content standards	Understand how the tool works Understand the practical module
Develop professionalism sustainably by taking reflective action	Evaluation at the end of the practicum
Utilize information and communication technology to develop themselves	Using Whatsapp Using google form Using spreadsheet

From the results of interviews with laboratory assistants (Table 2), it is obtained that there are indicators of professionalism competencies that can be found in the laboratory assistant program. This set of indicators arises from the existence of problem-solving activities by laboratory assistants during the practicum. In solving problems such as broken tools or incorrect data, students are required to understand the concepts and theories of practicum in order to fix the problem. In order for similar mistakes not to be repeated, it is necessary to take reflective action and utilize technology as a means of communication and facilitate the assessment system. This action includes the five indicators of professional competence. With the problems faced by all laboratory assistants able to show the five indicators of professionalism competence [37]. A laboratory assistant program is a means of teaching students as prospective teachers. This experience has a positive impact on the professional competence of prospective teachers [38].

3.2. Personality Competency

Indicator 1. Act in Accordance With The Norms, Religion, Law, Social, and National Culture Of Indonesia

Most laboratory assistants are aware of their actions in accordance with norms, religion, law, social, and national culture. In the laboratory assistant program, student assistants carry out opening activities just like what teachers do in the learning process. ER stated that it is important to hold opening activities such as prayer, greetings, and delivery of a series of activities.

"Yes, it is important, opening activities such as praying later so that the practicum runs smoothly and so that college students can remember God in every activity..." (ER)

"I open and close every activity with prayer, I believe that good things must start with good things..." (NF)

Not only religious behavior, but laboratory assistants also uphold norms and politeness in every activity. AQ explained that her unintentional rudeness left her feeling guilty to the point that she was very careful in his words.

"Once I accidentally said something rude to a fellow assistant during practicum, wow, I immediately felt guilty and was very careful in choosing words even with fellow assistants..." (AQ)

By participating in the laboratory assistant program, students learn about the assessment system that is in accordance with standards and is not based on the background of the assistant's relationship with the practicum students. AR explained that backgrounds such as being in the same organization might affect how assistants communicate, but not with an assessment system that must comply with standards.

"Familiarity might affect how the practicum students and I talk to each other, but it does not affect the assessment at all. The assessment system is already written and regulated in the assessment rubric, so I just follow it..." (AR)

A teacher plays a role not only as an educator, but also as an example whose every action is reflected by students [13]. From the results of this study, it was found that laboratory assistants act according to norms, because they are students whose actions are emulated by practicum students. Students in this program really understand what to do and do not refer to norms. With the national laboratory assistant program, students learn how to become an individual who complies with norms, religion, law, social and Indonesian national culture.

Indicator 2. Displaying Oneself as an Honest, Noble, and Role Model for Students and The Community

The research shows that there are individuals who are honest, have noble character, and are role models for practicum students. The laboratory assistants show that they really care about practicum students. Laboratory assistants always accompany students in every procedure and provide encouragement and motivation.

"Once I gave words like 'good job' and 'keep it up' when giving revisions to my students' laboratory report..." (NF)

NF stated that this was a form of motivation given to practicum students to remain enthusiastic in working on the report. In addition to providing encouragement, NF often helps practicum students with data processing and consultations outside of lecture hours.

"Once I was asked to correct their manually calculated data at 12 o'clock at night, I told them to do it tomorrow as well as teach them to use excel to make it easier..." (NF)

Helping students process data is not a laboratory assistant's job, but in fact most assistants are willing to help sincerely. During the practicum, the assistant took the time to answer students' questions regarding future college activities outside of practicum topics. Laboratory assistant students create a good and warm atmosphere between assistants and practicum students. Apart from that, laboratory assistants also show honesty in their duties.

"I judge honestly based on how they perform. Bad is bad, good is good without any cover up..." (AG)

AG's statement shows an honest attitude of the laboratory assistant by assessing according to the standard. Laboratory assistant ensures that laboratory activities start and end on time. Arriving not late is an obligation for laboratory assistants. AF said that she was never late for practicum, fearing that her tardiness would set a bad example for practicum students.

"I've never been late, but I often come across practicum students who are late. Apart from reprimanding students who are late, I also come on time so that they are also motivated to come on time..." (AF)

As teachers, they have the duty to be an example for students in thinking and behavior. Being able to present oneself as an honest, noble, and exemplary person is a very important personality competency for teachers [13],[31]. This program is able to show how students have honest personalities, have noble character, and are role models for students.

Indicator 3. Displaying Oneself as a Steady, Stable, Mature, Wise, and Authoritative Person

From the interview, it was found that being an assistant requires a mature personality. Being a laboratory assistant requires students not to mix personal matters with laboratory assistant duties.

"I always try to be professional to not bring my mood conditions with practicum activities..." (CL)

As another example, AR gave a solution on how she acted maturely in dealing with mood problems.

"I am afraid that my mood will affect the pre-test, so I usually organize myself first so that it does not affect laboratory activities..." (AR)

In running the laboratory assistant program, students are required to be able to build boundaries in order to create respect from practicum students and laboratory assistants. The existence of boundaries is able to portray laboratory assistants who are firm and authoritative.

"I think I am able to put myself and be respected as a laboratory assistant both inside and outside the classroom..." (AQ)

AQ conveyed the reason she felt appreciated by practicum students was due to her ability to place herself as an assistant. CL stated that the indicator of an assistant feeling appreciated by practicum students is by submitting laboratory reports on time and arriving on time.

"I feel appreciated because they submitted the report on time..." (CL)

In the laboratory assistant program, students are able to place themselves and behave in a stable, steady, mature, wise, and authoritative manner. This ability is needed to become a good teacher [16]. Teachers who have a good personality will also affect the development of student character [14].

Indicator 4. Demonstrate Work Ethic, High Responsibility, a Sense of Pride in Being a Teacher, and Self-Confidence

It was found that laboratory assistants have a high sense of responsibility. When assistants are unable to attend to duty, they will responsibly hand over the task to fellow assistants and give the same standard of assessment to practicum students.

"My fellow assistant was absent, and I was very willing to replace him. Before replacing the task, I first make sure how the assessment system is applied..." (CL)

CL explained how the form of responsibility from the assistant who could not attend was in the form of giving the power to assess and the assistant who replaced was in the form of awareness to ask about the assessment standards. This aims to maintain fairness in grading and a form of responsibility from both laboratory assistants. The work ethic of laboratory assistants is shown from the persistence of laboratory assistants in carrying out their duties. NF prepares small notes that help her in performing her duties professionally.

"Before the practicum, I first try the series of tools that will be tested to prevent any problems. I also prepare small notes about the experiment as a form of self-preparation to become an assistant..." (NF)

The same thing was done by ER by preparing a series of tools before the experiment and reading the module on the day before the practicum. Demonstrating work ethic, high responsibility, a sense of pride in being a teacher, and self-confidence are very important professionalism competencies for teachers [39],[40]. As prospective teachers, the awareness of these abilities is useful to prepare themselves to become teachers with good personalities.

Indicator 5. Uphold the Code of Ethics of the Teaching Profession

The fact obtained from the interview results is that most students in the laboratory assistant program who are prospective teachers do not understand in general what a code of ethics is.

"The code of ethics that I know is to be professional..." (ER)

This is due to the lack of explanation regarding the code of ethics for the teaching profession [41]. To implement the ethics that must be owned by educators, an educator must be able to comply with all the rules or norms that have been enacted in the code of ethics [42].

Table 3. Summary of Personality Competence Indicators With Themes From the Data

Act in accordance with the norms, religion, law, social, and national culture of Indonesia	<ul style="list-style-type: none"> - Doing opening activities according to religion - Do not speak harshly - Not differentiating practicum students based on background
Displaying oneself as a steady, stable, mature, wise, and authoritative person	<ul style="list-style-type: none"> - Fair in assessing, Honest in giving assessments - Helping to process data - Providing motivation - Conduct activities on time, Arriving on time or early
Demonstrate work ethic, high responsibility, a sense of pride in being a teacher, and self-confidence	<ul style="list-style-type: none"> - Does not involve mood in practical activities, Build boundaries with practicum students
Uphold the code of ethics of the teaching profession	<ul style="list-style-type: none"> - Cooperate with each other, Stick to the grading system, Make sure the equipment can be used

The interview results (Table 3) show the emergence of personality competence indicators. This indicator can be seen from how students exercise self-control and character development to fulfill their duties as laboratory assistants. This is evidenced by the behavior of laboratory assistants who are in accordance with the norms, honest, fair in assessing, responsible, noble, and can be a role model for practicum students. The existence of awareness in behaving as a laboratory assistant shows the personality competence that students get by participating in the laboratory assistant program [43],[44].

4. Conclusion

The laboratory assistance program plays an effective role in shaping the professionalism and personal competencies of physics education students as prospective physics teachers. These findings highlight the importance of a comprehensive approach to teacher preparation, not only deepening academic understanding but also shaping desirable character traits in educators. The contribution of this study lies in emphasizing the need for experience-based learning and theory-practice integration in physics teacher education. Suggestions for future research include longitudinal and comparative studies to better understand the long-term impacts and comparative effectiveness of pedagogical and social approaches in enhancing teacher competencies. Hopefully, this research will enrich the understanding of effective teacher preparation strategies and support efforts to improve the overall quality of education.

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