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## Profile of human resource qualifications and competencies for high school biology laboratories in Bantul Regency

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Article information	ABSTRAK
Article history Received October 12, 2022 Revised Dec 8, 2022 Accepted Dec 9, 2022	Laboratorium biologi menjadi unsur penting dalam memberikan pengalaman pada siswa dalam pembelajaran biologi, sehingga perlu pengelolaan yang baik dengan sumber daya manusia yang kompeten. Penelitian ini bertujuan untuk mengetahui profil kualifikasi dan kompetensi tenaga laboratorium dalam mendukung kegiatan pengelolaan laboratorium dengan melihat pencapaian tugas dan tanggung jawab untuk mendukung kegiatan pengelolaan laboratorium di SMA Kabupaten Bantul. Penelitian ini merupakan penelitian deskriptif. Teknik pengumpulan data menggunakan wawancara, observasi, dan kuesioner. Aspek yang diteliti dari kepala laboratorium adalah kompetensi manajerial dan professional, sedangkan pada laboran pada kompetensi administratif dan professional. Data dianalisis secara deskriptif. Hasil analisis diketahui bahwa pengelola laboratorium secara keseluruhan masih belum memenuhi standar tenaga laboratorium sekolah. Pada laboran, kompetensi administrasi lebih dominan daripada penerapan kompetensi profesional. Pengelolaan laboratorium biologi di sekolah A lebih optimal dibandingkan sekolah lainnya.
<b>Kata kunci:</b> Laboratorium Biologi Sumber daya manusia di laboratorium Kualifikasi dan kompetensi	<b>ABSTRACT</b> <b>Profile of human resource qualifications and competencies for high school biology laboratories in Bantul Regency.</b> The biology laboratory is an important element in providing students with experience in learning biology, so it needs good management with competent human resources. This study aims to determine the profile of the qualifications and competencies of laboratory staff in supporting laboratory management activities by looking at the achievement of duties and responsibilities to support laboratory management activities in SMA Bantul Regency. This research is descriptive. Data collection techniques using interviews, observation, and questionnaires. The aspects studied by the head of the laboratory are managerial and professional competence, while the laboratory assistant is on administrative and professional competence. Data were analyzed descriptively. The results of the analysis show that the laboratory
<b>Keywords:</b> Laboratory of Biology Human resources in Laboratory Qualification and Competence	

manager as a whole still does not meet the standard for school laboratory personnel. In laboratory assistants, administrative competence is more dominant than the application of professional competence. Management of the biology laboratory at school A is more optimal than other schools.

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## INTRODUCTION

The laboratory functions to carry out experiments, observations, training, and scientific testing of knowledge and technology (Elseria, 2016). The laboratory is also the most important element in encouraging the implementation of learning activities, especially learning biology which is a bridge between theory and the reality of evidence in real life (Yaman, 2016). In addition, a good laboratory requires good laboratory management as well. Therefore, it requires the presence of human resources in laboratories who are capable of administration and professionalism (Budiarti, et al., 2021). The laboratory manager is an effective and practical step in utilizing resources to achieve optimally designed goals with the sustainability of the role of the resources considered. Laboratory organizers have a relationship with the implementation and implementation of laboratory facilities consisting of buildings, laboratory equipment, biological specimens, and also chemicals so that their functions are maintained when practicum activities are carried out (Tawil, 2016).

The laboratory needs to be managed by human resources who have the skills and understanding of work in the laboratory. Apart from that, it can also comply with the regulations contained in the laboratory to avoid work accidents in the laboratory environment (Vendamawan, 2015). The function of management is understood as a process of supporting planning, organizing, leadership, and also controlling the work of personnel or members to achieve the expected goals (Nurhadi, 2018). Human resources and professional staff related to laboratory management are an integral part of the daily laboratory activities in operating and are skilled in combination management. Good laboratory management is not only supported by sophisticated equipment but also by available professional resources (Fiska, 2017).

Human resources play an important role in the success of laboratory management so that ideal laboratory conditions can be achieved (Iswanto, 2021). Human resources in the laboratory consist of laboratory heads, laboratory technicians, and laboratory assistants. Each laboratory personnel has duties according to the qualifications and competencies their respective duties and responsibilities both in terms of knowledge, understanding, and work skills. Human resources in high school biology laboratories must meet the qualification standards in laboratory management as stated in Permendiknas Number 26 of 2008 concerning Standards for School Laboratory Personnel.

The Ministerial Regulation stipulates that the head of the laboratory must have personality, managerial, social, and professional competencies. Meanwhile, the competence for laboratory technicians and laboratory assistants must also have personal, social, professional, and administrative competencies. The competencies needed in terms of laboratory management are the managerial and professional competencies of the head of the laboratory. In addition, administrative competence and professional competence are also needed from laboratory technicians as well as laboratory assistants.

Based on the implementation of laboratory management in schools, the referenced research shows that most schools are not optimal. Research conducted by Meita (2017) shows that laboratory human resources consisting of laboratory heads, technicians, and laboratory assistants are not fully in accordance with Permendiknas Number 28 of 2008 because most human resources do not have laboratory management training certificates from the government which should be qualifications from human resource laboratory. According to Susilo and Gufron (2018), Suwarno (2019), and Kasmawati & Masriani (2018) that the utilization and management of the laboratory are still low, this is due to the teacher's lack of optimal use of the laboratory the

room in the laboratory is less organized and the materials are less representative for practice activities. In addition, the duties and functions of the head of the laboratory are not optimal because sometimes the work of the head of the laboratory is concurrent with his duties which can be seen from the condition of the laboratory which is not well managed, therefore there is a need for skills training provided by school laboratory staff.

Based on the information obtained from the previous research, it can be concluded that optimizing the use of laboratories is still inadequate in several schools. In addition, there are still some human resources in the laboratory that are not up to standard. Likewise, based on the observations of several schools in Bantul Regency, there are still schools where teachers are also laboratory assistants. This shows that there is still a mismatch in the qualifications and competencies of laboratory personnel in schools. Therefore this study aims to further analyze the qualification and competency profiles of laboratory personnel in supporting laboratory management activities by looking at the achievement of their duties and responsibilities according to Permendiknas Number 26 of 2008. The profile data obtained can be used as a reference or as evaluation material for the government and the school itself for the benefit of optimal laboratory utilization.

## METHOD

This research is included in the descriptive research. This study only explains or describes the condition of the qualifications and implementation of competencies in high school biology laboratory personnel in the Bantul district. The sample in this study was taken randomly from 3 high schools with the criteria of having been accredited A. The reason for choosing public high schools with A accreditation was assumed to have good standardization and qualifications. Research data collection was carried out in June 2022. The subjects in this study were the head of the laboratory, laboratory assistants, and laboratory technicians.

Data collection techniques carried out were interviews, observations, and questionnaires. The research instruments used included interview guidelines, observation guidelines, and questionnaires. The interview guide sheet for the head of the laboratory consists of qualification aspects, namely managerial competence and professional competence with 36 questions. Then, the questionnaire sheet for laboratory assistants and laboratory technicians consists of 2 aspects of qualification, namely administrative competence and professional competence with 21 questions using consistent answers in the form of Yes/No answers. The instruments used have been validated by expert judgment.

The data analysis technique used to analyze the data from this study is descriptive analysis. The results of interviews conducted with the head of the Biology Laboratory are used to describe the suitability of the duties and responsibilities of the head of the laboratory, technicians, and laboratory assistants. Meanwhile, the results of observations and questionnaires were analyzed using a Likert scale. The questionnaire used consisted of a laboratory assistant questionnaire regarding the implementation of managerial competence and professional competence of biology laboratory staff that had been implemented. A closing statement questionnaire containing Yes/No answer choices were prepared using the Gutman scale. The percentage calculation using the Sugiyono formula (2012) is as follows:

$$PS = \frac{\sum ST}{\sum SM} \times 100\%$$

Description:

PS = Score presentage

ST = Generated Total Score

SM = The maximum score that can be obtained



All data obtained is processed from the number of sub-indicators acquired. The data is categorized into 4 categories from very good to very bad. According to Arikunto (2013), the data can be characterized as follows:

**Table 1.** Assessment Criteria

Category	Percentage
Excellent	80% - 100%
Good	60% - 80%
Passably	40% - 60%
Poorly	20% - 40%
Not Good	0% - 20%

## RESULTS AND DISCUSSION

### Profile of Qualifications and Competency Implementation of School Laboratory Human Resources A

Based on the results of the study, it can be seen that laboratory human resources at school A consist of laboratory heads, laboratory assistants, and laboratory technicians. This shows that the laboratory personnel accordance with Permendiknas No. 26 of 2008. To find out the appropriateness of laboratory human resources qualifications, an interview was conducted with the head of the laboratory. The results of interviews with the head of the school A laboratory revealed that the head of the school A laboratory had a bachelor's degree and was the head of the biology, chemistry, physics, and computer laboratories. The Head of School Laboratory A serves as the head of the laboratory through the teacher path with an undergraduate education qualification. In addition, the head of the School A laboratory already has a laboratory management certificate. This shows that the head of the school laboratory A has met the qualification standards as the head of the biology laboratory. The qualifications of the laboratory assistant are not suitable because the laboratory assistant does not have a certificate as a laboratory assistant for biology.

Based on the results of interviews with the head of the laboratory of school A on the aspect of managerial competence competency indicators for activity planning and laboratory development, it is known that the head of the laboratory has prepared a work program. On the indicators of the implementation of the laboratory administration system development, the laboratory administration system was developed in writing and manually using books. Indicators for preparing standard operating procedures for laboratory work, prepared accordance with existing regulations. The head of the laboratory coordinates practicum activities with the teacher through a mutually agreed-upon schedule. The preparation of the schedule for laboratory activities is carried out by coordinating between the head of the laboratory and the teacher. The head of the laboratory monitors the implementation of laboratory activities by using a list of notes written manually in a book. The head of the laboratory also evaluates work programs that are not working and adds programs that did not exist before. The head of the laboratory monitors the condition and safety of materials and laboratory equipment by checking them regularly. The head of the laboratory does not evaluate the results of the performance of laboratory assistants.

The head of the laboratory must also have professional competence. When viewed as a whole the professional competency of the head of the School laboratory has followed the process of developing thoughts related to laboratory activities that are used as a vehicle for education by following the existing curriculum which means following every change in the curriculum. The head of the laboratory applies the results of innovations/products as teaching materials in the laboratory (such as preserved animals). The practicum guidebook/guide is compiled in the form of an LKPD which will be filled out by students in practicum activities. The design of laboratory activities for education is carried out using worksheets that contain work methods and designs. The design of laboratory activities for research at school A has not been carried out because research requires a laboratory that is more complete and has adequate facilities. The head of the

laboratory has published scientific papers. In setting regulations in the laboratory regarding occupational health and safety, follow the regulations set by the government. Procedures for handling hazardous and toxic materials are carried out by informing safety or proper work procedures before students carry out practicum activities. Steps in monitoring hazardous materials and toxic materials as well as work safety equipment are carried out by encouraging students before carrying out practical activities related to work methods and work safety.

The competence of laboratory assistants at school A in the aspect of administrative competence got a score of 75% (good) and professional competence of 76.47% (good) which is presented in Table 3. For laboratory technicians, the competency suitability and duties of laboratory technicians are presented in Table 2.

**Table 2.** Suitability of Technician Tasks

School	Administrative Competence	Professional Competence
School A	100%	91,67%
School B	0,00%	0,00%
School C	0,00%	0,00%

Based on table 2. shows the percentage of administrative competence of laboratory technicians in School A of 100% (very good). The professional competence of technicians at School A also gets 91.67% (very good). This shows that laboratory technicians have good competence according to standards and have responsibility for their duties as biology laboratory technicians. The percentage of administrative and professional competence of School B and C technicians is 0.00% (not good) because Schools B and C do not have laboratory technicians.

#### **Profile of Qualifications and Competency Implementation of School Laboratory Human Resources B**

The profile of laboratory staff at school B shows that there are only laboratory heads and laboratory assistants. The laboratory assistant doubles as a laboratory technician. Based on the results of interviews with the head of the Biology laboratory, it was found that the head of the laboratory explained the path of teachers with undergraduate education qualifications. The teacher has experience managing practicum activities since 1992 and has a laboratory management certificate. This shows that the qualifications of the head of the laboratory are in accordance with the standards of Permendiknas No. 26 of 2008. The profile of the laboratory assistant at school B is in accordance with the qualifications based on the standard. The laboratory assistant at school B already has a certificate as a biology laboratory assistant, but unfortunately, school B does not have a laboratory technician. Therefore the completeness of the profile of laboratory personnel in school B is not up to standard.

The Head of the Laboratory must have managerial competence. The head of the laboratory in preparing the laboratory development plan by looking at the material or KD that can be practiced, for example in grade 10 what materials can be practiced, and so on. Then coordination with TU regarding the procurement of tools and materials is carried out. Laboratory management planning, because the practicum schedule joins the face-to-face lesson schedule, so the practicum schedule is adjusted to the face-to-face schedule. In this case, there is no special practicum schedule, so you have to adjust the schedule to enter the class. In addition, School C's biology laboratory is used as a classroom for a while because there is still a shortage of classrooms, so when going to do practicum students have to bring equipment to another class or sometimes change classes (students who occupy classes in the biology laboratory change places). Furthermore, regarding the implementation of the development of the laboratory administration system, it is handed over to the laboratory assistant, regarding the preparation of lab arrangements, materials that have expired/expired, and others. If you need chemicals, coordinate with the chemistry teacher. The steps for preparing standard operating procedures (POS) for laboratory work are by making practicum rules, and students must comply with these

rules such as using lab coats, and so on. Practicum coordination is coordinating between teachers and laboratory assistants. For example, if the teacher requires certain materials, the laboratory assistant will prepare them.

Monitoring the implementation of training activities is carried out by joint monitoring of teachers and the workforce. In assessing the laboratory activities at School B, it was still unprofessional, that is, it was only discussed by fellow teachers. Sometimes they review, for example after doing catalase enzyme labs, it's just found that the H<sub>2</sub>O<sub>2</sub> is not good enough. Usually, there are also teacher discussions among subjects. The step in compiling laboratory activity reports is that practicum reports already have a writing systematic, some are made based on groups and individuals depending on the conditions. In detailing the details of laboratory assistant duties, the head of the laboratory just followed along because there were already details of these tasks, which were already there from the previous head of the laboratory, so just proceed from that. If it is still suitable/suitable, it will still be used, if there is something that needs to be added, it can be added. The steps in determining the workforce's work schedule, for example during practical exams for biology, chemistry, and eyeglasses, are the same because there is only one workforce. But sometimes assisted by the teacher. Dapodic reports are made by laboratory assistants. Before the pandemic, monthly and annual reports were always made regarding laboratory conditions and utilization. However, as long as the pandemic report is not made, it has been combined with, for example, an assessment of the school principal's performance, and the report is made simultaneously. Evaluation of the performance of the biological laboratory workforce is only carried out by fellow biology teachers. Evaluation program evaluation laboratory for further improvement is carried out in the form of notes, if indeed at certain stages a written report is requested. But when every practicum is carried out, after the practicum is carried out, there will be a discussion for improvement.

The head of the laboratory must have professional competence. The head of the laboratory has followed the development of ideas regarding the use of laboratory activities as a vehicle for education by motivating students because if there is a practicum students want to know more. The head of the laboratory in implementing the results of innovation or laboratory studies by participating in training. Preparation of a practicum guide or guide (manual) is carried out using worksheets or when there is an MGMP, fellow teachers exchange ideas and then ask for lab assistants to make or print them. Implementation of laboratory activities for educational purposes, namely by conducting practicum on material that allows it to be practiced, while for research there are students who take part in scientific competitions where all teachers also participate in these activities. The head of the laboratory at School B has never published a scientific paper. The application of provisions regarding occupational health and safety is carried out by following the Standard Operating Procedures (SOP) of the laboratory and procedures for handling hazardous and toxic materials such as for chemicals to be placed in the chemical laboratory which has a fume cupboard and in the biological laboratory only for tools such as microscopes, glasses. preparations, chemistry classes, scales, torso, and others. Monitoring of hazardous and toxic materials, as well as monitoring of work safety equipment, is carried out regularly, but during the pandemic, it was not carried out.

#### **Profile of Qualifications and Competency Implementation of School Laboratory Human Resources B**

The profile of laboratory staff at school C only has a laboratory head. The head of the laboratory doubles as a laboratory assistant and laboratory technician. The head of the laboratory has served through the teacher route with an undergraduate education qualification since 2018 and has a certificate as head of the laboratory. The head of the laboratory in the aspect of managerial competence compiles a laboratory development plan in the future that is more towards applied biology because it is more factual and fun than the surrounding materials. This is also to avoid chemicals that easily expire. The laboratory management plan can be seen from the activity report with the annual repetition schedule with the implementation of the manual laboratory administration system development because it records tools and materials one by one with the book. In the step of preparing standard operating procedures for laboratory work

the teacher proposes a design, tools, and materials to be used during the practicum and then records and makes a schedule, monitors at the end of the tool, and periodically checks the material from carrying out laboratory activities every month. Because the head of the laboratory doubles as a technician and laboratory assistant in formulating details of tasks, schedules, and assessing the supervision of technicians and laboratory assistants has not yet been held.

The competence of the head of the laboratory is also seen in his professional competence. The head of the laboratory follows the development of ideas regarding the use of laboratory activities as a vehicle for education by updating the MGMP and sharing, then participating in independent training and exchanging ideas with fellow teachers. However, due to limitations, the head of the laboratory is more knowledgeable in his field of expertise and the head of the laboratory also applies the results of innovations or laboratory studies by participating in many of these training. The head of the laboratory prepares a practicum guide or manual by taking from the teacher's manual and the internet which is then adjusted to the laboratory conditions. The design of laboratory activities for education in School C has been carried out, but the research has not yet been carried out. The head of the laboratory also has never published a scientific paper because of the many tasks that must be done. Provisions regarding school occupational health and safety are determined by following laboratory Standard Operating Procedures (SOP) and procedures for handling hazardous and toxic materials, which are handled according to the nature of the materials.

Based on the results of observations and questionnaires for laboratory assistants the implementation of laboratory management for each indicator in three schools is presented in Table 3.

**Table 3.** Suitability of Laboratory assistant Task

School	Administrative Competence	Professional Competence
School A	75%	76,47%
School B	87,50%	64,70%
School C	0,00%	0,00%

Based on table 2, it is known that the laboratory assistant at School A has an administrative competence suitability percentage of 75% which means good and professional competence of 76.47% which means good. Laboratory assistants at School B have an administrative competence suitability percentage of 87.50% which means very good and professional competence of 64.70% which means good. Laboratory assistants at School C have an administrative competency suitability percentage of 0.00% which means it is not good and professional competence is 0.00% which means it is not good, this is because School C does not have laboratory assistants. This shows that the duties and responsibilities of several school laboratory managers have been carried out in accordance with those stated in Permendiknas No. 26 of 2008.



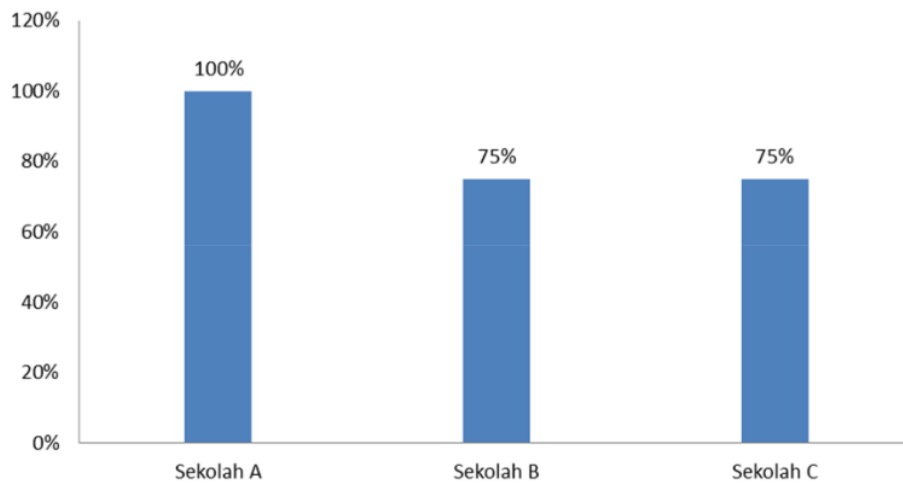


Figure 1. Observation of data as evidence of suitability for laboratory management tasks

Based on Figure 1. shows the percentage of data observations as evidence of the suitability of the laboratory manager's duties. The percentage in School A is 100% which indicates that it is in the very good category. The percentage in Schools B and C is 75% which indicates that they are in a good category. This shows that there is good data suitability to support the implementation of the duties and responsibilities of the laboratory manager.

Laboratory management requires work professionalism from laboratory personnel, therefore to increase the professionalism of laboratory personnel it is necessary to have a high-skill attitude (Decaprio, 2013). Based on the research that has been done, there are still some obstacles, for example in School C, the head of the laboratory doubles as a laboratory assistant and technician. This of course will reduce the optimal implementation of laboratory management. In addition, the laboratory assistants and technicians for School A have never attended seminars or training related to laboratory management. So that this can make the contribution of the professionalism of the laboratory manager not optimal.

The managerial and professional competencies of Laboratory heads in the three SMAs were partially implemented and some were not implemented. Meanwhile, other personnel involved in laboratory management as technicians and laboratory assistants were almost entirely implemented. The development of managerial competence is aimed at providing the best quality services in school laboratories, these services in the teaching and learning process accompanied by practicum activities are considered as a vehicle, namely a place where students can build their knowledge and skills. In its implementation or application, the development of managerial competence for the head of the laboratory is often constrained by a lack of understanding of these competencies (Kasmawati & Adilla, 2017). In laboratory management, there needs to be a good organization. The existence of an organizational structure is considered very important, to an organization if those who play a role in the structure do not carry out their duties properly then it will not work (Andriani, 2016).

The implementation of monitoring and evaluation of laboratory activities in general at the three SMAs has not been carried out properly. As is the case with the supervision of tools and materials, as well as administrative supervision in the laboratory, they have not been carried out optimally. This can happen because the teacher or head of the laboratory sometimes doubles as a laboratory assistant or technician and the head of the laboratory is not only the head of the biology laboratory but also the head of the physics and chemistry laboratories. For example, what happened to School C and School B which only had a laboratory head and 1 laboratory assistant? This is in accordance with the results of research from Sari, et al (2013) which discussed the management of biology laboratories in several private high schools in the Jambi

city area, in which the study concluded that the management of several high schools had not been carried out optimally so that laboratory utilization could not be carried out to its fullest possible.

The laboratory will be optimal in its utilization and contribution if it has good management, of course, supported by a plan that will lead to the program that has been prepared (Nurlia & Agustina, 2018). The quality of the work programs in the three SMAs is quite good. Planning for practicum activities in schools regulates the laboratory use schedule with the subject schedule as a reference. The existence of this division of the schedule aims to avoid clashing time between one another, an activity will run effectively if a schedule of activities has been prepared so that it can achieve the desired expectations. Laboratory activity planning is also generally associated with laboratory use schedules and media to be used in learning.

## CONCLUSION

Based on the research results, it can be concluded that the profile of biology laboratory personnel is still not in accordance with the standards of Permendiknas Number 26 of 2008. Only school A has complete laboratory personnel, namely the head of the laboratory, laboratory assistants, and laboratory technicians. The qualifications of laboratory personnel for laboratory heads in the three schools are in accordance with the qualifications. The qualifications of the laboratory assistant are not up to standard (at school A the laboratory assistant does not yet have a certificate as a laboratory assistant and at school C the laboratory assistant is also the head of the laboratory). The qualifications and competencies of laboratory technicians are not up to standard (schools B and C do not have laboratory technicians). The competence of the head of the laboratory in terms of managerial and professional competence in the three schools is good. The competence of laboratory assistants in schools A and C is good and the competence of laboratory technicians in school A is already very good. The suitability of the implementation of the duties and responsibilities of laboratory management is best in school A.

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