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Enhancing Animal Physiology Practicum: Exploring Students' Perceptions and Influencing Factors

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ABSTRACT

Purpose of the study: The purpose of this study was to determine the perception of Biology Education students towards the implementation of Animal Physiology practicum in the Biology Education Laboratory and to determine the factors that influence student perceptions towards the implementation of the practicum. This study aims to provide insight into improving the quality of practicum learning in higher education.

Methodology: This type of research is descriptive with qualitative and quantitative approaches. The subjects of the study were fourth semester Biology Education students of UIN Alauddin Makassar. Data collection techniques used a Likert scale questionnaire 1–5 and documentation. Data analysis techniques include descriptive qualitative analysis for narrative data and quantitative analysis for questionnaire data in a descriptive-qualitative manner.

Main Findings: The main findings of this study show that students perceive teaching assistants as supportive in guiding practicum groups, though there are issues with punctuality. Facilities and infrastructure, including laboratory cleanliness and equipment, are generally adequate but require improvement. Students report better understanding of animal physiology post-practicum, and active participation during the exercises. However, some students were not diligent with preliminary tasks, and there were discrepancies in the provision of assignments and material explanations.

Novelty/Originality of this study: This study offers a unique perspective by integrating the roles of teaching assistants and laboratory assistants in shaping student perceptions of animal physiology practicums. It highlights the importance of punctuality, material explanations, and active involvement, providing practical insights for improving laboratory-based learning.

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1. INTRODUCTION

Education is a conscious effort and aims to develop human quality. As an activity that is aware of the goal, then in its implementation it is in a continuous process, in every type and level of education everything is related to an integral education system [1]-[3]. Globalization has given rise to new demands on higher education institutions. [4]-[6]. One of the triggers for this demand is the achievement of progress in information and communication technology to increase the nation's competitiveness. The inclusion of education in development

efforts is a strategic step. Universities are one of the providers of this education service. In general, the purpose of organizing education including in universities is to create quality and competitive human resources [7], [8]. Higher education is a place to gain knowledge that is always undergoing renewal and development as an effort to find a more effective and efficient curriculum structure, education system and teaching method, namely education that is able to develop the potential of students, so that students have the ability to solve the educational problems they face.

Biology is related to how to find out about nature systematically. So that biology is not only the mastery of a collection of knowledge in the form of facts, concepts or principles, but also a process of discovery [9], [10]. Biology education is expected to be a vehicle for students to learn about themselves and the environment, as well as prospects for further development in applying it in everyday life [11], [12]. The learning process emphasizes providing direct experience to develop competencies to explore and understand the environment scientifically [13]-[15]. Science education is directed to discover and act so that it can help students to gain a deeper understanding of the environment [16], [17]. Metode yang paling tepat adalah dengan melakukan praktikum di laboratorium.

Practicum is a learning process where students do and experience for themselves, follow the process, observe objects, analyze, prove and draw conclusions about an object, condition and process from the material studied about natural phenomena and their interactions so that they can answer questions obtained through inductive observation. Benefits Practical activities can be used for several activities that hold students' skills [18]. Practical activities can be carried out in the laboratory or outdoors. The role of the laboratory is very important in learning [19], [20]. The roles include the first as a vehicle to develop basic skills in observing or measuring (using appropriate measuring instruments and appropriate process skills) and other process skills, such as recording data, drawing conclusions, communicating, and working in teams [21], [22]. Second, the laboratory can also be used as a vehicle to prove concepts that have been discussed previously.

Third, the laboratory can also be used as a vehicle to develop thinking skills through the problem-solving process in order for students to find their own concepts. Physiology as a vital branch of biology, investigates in depth all aspects related to the function, activity, and structural organization of cells [22]-[24]. The definition surrounding it covers a very broad range, which includes the study of various mechanisms, functions, and operations that occur in organisms, from the organ level to the tissue and cell level [26], [27]. Its unlimited exploration will discuss how organs, tissue systems, and cells specifically operate in the body of living things. Not only limiting itself to descriptions, physiology also tries to reveal the principles of physics and chemistry that are hidden behind the complexity of life processes [28], [29]. That is why physiology is the foundation for understanding the complex interactions between various physical and chemical factors that affect the vital processes that occur in organisms [30], [31]. From the simplest to the most complex, all forms of life exhibit functional characteristics that are typical and essential for their survival [32], [33]. Even in simple entities, such as viruses that stand with their single cells, to the level of humans who have such complex cell structures, physiology shows how important it is to reveal the functional properties that form the basis for the survival of every creature.

The practicum that will be the author's research is the animal physiology course, this animal physiology course is a course in creative skills that must be taken by every student majoring in biology education. This course is distributed in the even semester (semester 4) at the Alauddin State Islamic University of Makassar, Department of Biology Education. The scope of this course includes: basic structure of animal body tissue, Permeability and transportation, haemostasis, digestion and digestive system, movement system, osmoregulation and excretion, respiration, nervous system, senses, endocrine and reproduction, this animal physiology course has a weight of 3 credits so there is a practicum in it. The materials practiced include: Cell homeostasis, microcirculation in frogs, blood, reflex action properties, poikilometermic animal adjustments to environmental oxygen, respiration, enzymes and enzyme activity, and food testing. Preparation and implementation of eight animal physiology practicum titles usually consist of assistance, giving preliminary assignments, responding to the material to be practiced, practicum, making practicum reports, and checking reports [34].

Previous research on the implementation of practicums in biology education has generally highlighted the importance of practicums in improving students' understanding of biological material and in-depth laboratory skills [35], [36]. Previous studies have focused on factors that influence the effectiveness of practicums, such as instructor quality, laboratory facilities, and the diversity of practicum materials provided [37], [38]. In addition, these studies are often quantitative in nature, relying on frequency data to evaluate the success of practicums in general without delving deeply into individual students' perceptions of the practicum experience. However, most previous studies have not specifically explored students' perceptions of the implementation of Animal Physiology practicums, especially in the context of Biology Education programs in higher education. This study highlights this gap by exploring students' perceptions in more depth, both in terms of understanding the physiological concepts learned through practicums, and external factors that influence their experiences. Animal Physiology practicums at Alauddin State Islamic University Makassar, which are a new topic and have not been widely studied, focus on very complex materials, such as cell homeostasis, microcirculation in frogs, and animal respiration processes.

This study provides novelty by using a descriptive approach to explore students' perceptions of the success of practicums and the factors that influence them, something that has not been widely discussed in previous literature. The current research has high relevance in the context of curriculum development and learning methods in higher education, especially in the field of biology [38]-[40]. This study not only focuses on the assessment of practicum results, but also tries to identify aspects that influence students' perceptions such as facilities, interactions with instructors, and direct experiences they gain during the practicum. The implications of this study will provide further insight into the development of learning strategies, which involve refining teaching methods and improving the quality of practicum facilities to achieve better educational goals. Thus, this study fills the gap between previous studies that only assess the effectiveness of practicums in general and more in-depth research on students' perceptions of the quality of practicum implementation. This study is expected to contribute to improving the quality of education, especially in teaching complex courses such as Animal Physiology, which require direct understanding and in-depth practical experience from students.

Based on the description above, the purpose of this study is to determine the perceptions of Biology Education students towards the process of implementing Animal Physiology practicums in the Biology Laboratory of the Biology Education Department and to determine the factors that influence Biology Education students' perceptions towards the process of implementing Animal Physiology practicums in the Biology Laboratory of the Biology Education Department. The urgency of this research also lies in the importance of continuous evaluation of the implementation of practicums, to ensure that practicums not only provide direct experience to students, but also encourage them to develop deeper scientific competence. By knowing the factors that influence student perceptions, universities can improve and adjust teaching methods and increase the effectiveness of practicums in supporting the achievement of better educational goals.

2. RESEARCH METHOD

2.1 Research Design

This study uses a descriptive design with qualitative and quantitative approaches. The aim is to describe students' perceptions of the implementation of practicums in the Biology Laboratory. The qualitative descriptive method was chosen to provide an in-depth understanding of students' perceptions, based on data collected through observation, questionnaires, and documentation [42], [43].

2.2 Research Procedures

This research procedure is carried out through several stages. The first stage is preparation, where the researcher prepares a research proposal, determines the location and subject of the research, and prepares the instruments to be used. Furthermore, at the data collection stage, the researcher conducts a survey using a questionnaire and collects relevant documents from the research location. After the data is collected, the next stage is data analysis, where the data is analyzed descriptively to provide an in-depth picture of student perceptions. The research process ends with reporting the research results, namely compiling a report based on the findings that have been analyzed and documenting them in the final research report.

2.3 Research Subject

The subjects of this study were Biology Education students in the fourth semester of the Faculty of Tarbiyah and Teacher Training, UIN Alauddin Makassar who were undergoing animal physiology practicums. The object of the study was a means to obtain and collect data, but in this research activity, it was not possible to reach all of these objects [44]. All students in this population were sampled using the purposive Sampling technique, where the entire population was taken as a sample.

2.4 Data Collection Techniques

The data collection technique in this study uses two main instruments. The research instrument is a tool used to collect data [45], [46]. First, a questionnaire that functions to collect student perception data. The questionnaire is compiled using a Likert Scale of 1–5, where the number 1 indicates "very inappropriate" and the number 5 indicates "very appropriate." Second, documentation used to collect additional data in the form of documents relevant to the implementation of the practicum, such as activity reports or other documents available at the research location. The documentation method is a way of collecting data by recording existing documentation materials that are relevant to the research objectives [47], [48]. These two techniques complement each other in obtaining comprehensive data regarding student perceptions of the practicum carried out.

2.5 Data Analysis Techniques

The data analysis technique in this study involved two approaches, namely qualitative and quantitative data analysis. Qualitative data that is narrative in nature, obtained through documentation, is analyzed descriptively

to provide a deeper picture of the context and background of students' perceptions of the implementation of the practicum. Meanwhile, quantitative data obtained through questionnaires are calculated by calculating the frequency of answers in each category, then the percentage of each category is calculated to provide a picture of the distribution of respondents' answers. The results of this quantitative analysis are then interpreted descriptively-qualitatively to produce more comprehensive conclusions regarding students' perceptions.

3. RESULTS AND DISCUSSION

Regarding human resources including assistant lecturers and laboratory assistants in animal physiology practicums in the biology laboratory of biology education, faculty of tarbiyah and teacher training. The results of the calculation of the student perception questionnaire are as follows:

Table 1. Percentage of Answers Human resources in animal physiology practicums in biology laboratories

No.	Statement	Answer					Amount
		VI	NA	LA	A	VA	
1	Teaching assistants accompany each group during the practicum.	0 0 %	0 0 %	0 0 %	32 45.7 %	38 54.2 %	70 100 %
2	The practicum was carried out on time	0 0 %	10 14.2 %	20 28.5 %	32 45.7 %	8 11.4 %	70 100 %
3	The teaching assistant and laboratory assistant arrived on time.	3 4.2 %	10 14.2 %	27 38.5 %	22 31.4 %	8 11.4 %	70 100 %
4	The teaching assistant and laboratory assistant did not arrive on time.	8 11.4 %	14 20 %	25 35.7 %	21 30 %	2 2.8 %	70 100 %
5	The teaching assistant does not accompany each group during the practicum.	17 24.2 %	40 57.1 %	10 14.2 %	2 2.8 %	1 1.4 %	70 100 %
6	The practicum was not done on time	4 5.7 %	22 31.4 %	22 31.4 %	17 24.2 %	5 7.1 %	70 100 %

Based on the results of the questionnaire for human resources in animal physiology practicum in the biology laboratory, data was obtained that from three statements that supported (Favourable) and three statements that did not support (Unfavourable). Of the three supporting statements submitted, the largest point was in the statement that was very appropriate (VA), namely 54.2% for the teaching assistant accompanying during the practicum, the practicum was carried out on time, very appropriate (VA) 11.4%, appropriate (A) 45.7% and less appropriate 28.5%, for teaching assistants and laboratory assistants arrived on time, very appropriate (VA) 11.4%, appropriate 31.4% and less appropriate 38.5%. The percentage results showed that human resources (Assistant and laboratory assistant) for animal physiology practicum for assistants who accompanied each group of students were very good, but the punctuality in the start of the practicum and the arrival of teaching assistants and laboratory assistants in the laboratory were still not good. Regarding human resources, they include teaching assistants and laboratory assistants in animal physiology practicums in the biology laboratory of biology education, Faculty of Tarbiyah and Teacher Training.

Regarding the facilities and infrastructure revealed in this study, it concerns the completeness and suitability of the tools and materials and the condition of the room used to carry out animal physiology practicums. Based on the questionnaire statement, namely for the statement "each group gets furniture (tables and chairs) according to the number of members" most respondents answered "very appropriate" 35.7% and "appropriate" 30%. This shows that the practicum gets furniture (tables and chairs) that are appropriate to carry out animal physiology practicums. For the statement that the laboratory has complete research tools to support the practicum according to procedure, respondents answered 14.2% very appropriate, 38.5% appropriate, 37.1% less appropriate, 8.5% not appropriate, and 1.4% very inappropriate. The percentage above shows that the provision of complete tools according to procedure is still incomplete or still inadequate. Laboratory assistants provide materials to be practiced, 25.7% very appropriate, 40% appropriate, 20% less appropriate, 10% not appropriate, and 4.2% very inappropriate. The percentage above shows that the provision of materials to be practiced is very good. For the statement of laboratory cleanliness, 14.2% were very appropriate, 44.2% were appropriate, 24.2% were less appropriate, 15.7% were inappropriate, and 1.4% were very inappropriate. The percentages above indicate that laboratory cleanliness has been well maintained. The implementation of the practicum can run smoothly if supported by adequate and complete facilities and infrastructure according to needs. Regarding the facilities and infrastructure revealed in this study, it concerns the completeness and suitability of the tools and materials and the condition of the room used to carry out the animal physiology practicum. The results of the calculation of the student perception questionnaire are as follows:

Table 2. Percentage of Answers regarding the completeness of facilities and infrastructure in animal physiology practicums in the biology laboratory

No.	Statement	Answer					Amount
		VI	NA	KS	VI	NA	
1	Each group gets furniture (tables and chairs) according to the number of members.	4 5.7 %	8 11.4 %	12 17.1 %	21 30 %	25 35.7 %	70 100 %
2	The laboratory has complete research equipment to support the implementation of practical work according to procedures.	1 1.4 %	6 8.5 %	26 37.1 %	27 38.5 %	10 14.2 %	70 100 %
3	The laboratory assistant provides the tools and materials that will be used in the experiments.	3 4.2 %	7 10 %	14 20 %	28 40 %	18 25.7 %	70 100 %
4	Laboratory cleanliness is always maintained	1 1.4 %	11 15.7 %	17 22.8 %	31 20 %	10 0 %	70 100 %
5	Laboratory cleanliness is not always maintained	4 5.7 %	36 51.4 %	16 22.8 %	14 20 %	0 0 %	70 100 %
6	Each group does not get furniture (tables and chairs) according to the number of members.	15 21.4 %	37 52.8 %	14 20 %	3 4.2 %	1 1.4 %	70 100 %

In the context of the complexity of differences in perception, understanding this diversity becomes an essential aspect for understanding the dynamics of social interaction. It is important to recognize that variations in perception do not solely come from individual factors, but are also influenced by the environment and the accompanying social context [52], [53]. Interactions between individuals within a group or society can form shared norms and views, but individual differences remain influential and relevant in building diversity in perspective. The importance of understanding the factors that shape perception becomes increasingly clear in the context of this social diversity. The process of forming perceptions does not only occur in the individual's personal space, but is also closely related to social and cultural dynamics that influence general views. Therefore, further exploration of how interactions with the surrounding environment and the influence of social contexts can shape and modify individual perceptions is essential in a comprehensive understanding.

Regarding the technical implementation of the practicum revealed in this study, it concerns the influence of assistance activities in providing an understanding of the material for the practicum, the efficiency and effectiveness of the implementation of the animal physiology practicum. Based on the results of the questionnaire on the technical implementation of the practicum on the statement "I understand the material on animal physiology better after doing the practicum" as many as 32.8% answered very appropriate and 67.1% answered appropriate. This shows that students understand the material on animal physiology better after doing the practicum. On the statement "I was active during the practicum" as many as 32.8% answered very appropriate, 64.2% answered appropriate, and 2.8% answered less appropriate. So it can be seen that students are always active during the animal physiology practicum activities. On the statement "I am challenged to know the results of observations properly and correctly" as many as 32.85 answered very appropriate, 61.4% answered appropriate, 1.4% answered less appropriate, 0% answered inappropriate and 4.2% answered very inappropriate. This shows that students are challenged to carry out practicum activities properly and correctly during the practicum activities. For the statement "I am diligent in making preliminary assignments and animal physiology lab reports" 18.5% were very appropriate, 62.8% were appropriate, 8.5% were less appropriate, 10% were not appropriate, and 0% answered very inappropriate. This shows that students are diligent in making preliminary assignments and animal physiology lab reports. For the statement "The teaching assistant provides a brief explanation of the material to be practiced" 27.1% answered very appropriate, 55.7% answered appropriate, 8.5% answered less appropriate, 8.5% answered inappropriate, and 0% answered very inappropriate.

Based on the statements above, the factors that influence a person's perception can be studied as follows:

a. Internal factors: feelings, attitudes and personality of the individual, prejudices, desires or expectations, attention (focus), learning process, physical condition, mental disorders, values and needs as well as interests, and motivation.
b. External factors: family background, information obtained, knowledge and needs around, intensity, size, resistance, repetition of movements, new and familiar things or unfamiliarity of an object.

The results of the calculation of the student perception questionnaire are as follows:

Table 3. Percentage of technical answers regarding the implementation of practical work in animal physiology practical work in the biology laboratory

No.	Statement	Answer					Amount
		VI	NA	KS	S	NA	
1	I understand the animal physiology material better after doing the practical work.	0 0 %	0 0 %	0 0 %	47 67.1 %	23 32.8 %	70 100 %
2	I was active during the practicum	0 0 %	0 0 %	2 2.8 %	45 64.2 %	23 32.8 %	70 100 %
3	I am challenged to know the results of observations properly and correctly	3 4.2 %	0 0 %	1 1.4 %	43 61.4 %	23 32.8 %	70 100 %
4	I am diligent in making preliminary assignments and reports on animal physiology practicals.	0 0 %	7 10 %	6 8.5 %	44 62.8 %	13 18.5 %	70 100 %
5	The teaching assistant provides a brief explanation of the material to be practiced.	0 0 %	6 8.5 %	6 8.5 %	39 55.7 %	19 27.1 %	70 100 %
6	The teaching assistant provides questions regarding the practical material (responses) before the practical takes place.	0 0 %	4 5.7 %	9 12.8 %	37 52.8 %	20 28.5 %	70 100 %
7	The preliminary and response tasks helped me understand the practical material that would be carried out.	0 0 %	1 1.4 %	2 2.8 %	38 54.2 %	29 41.4 %	70 100 %
8	The teaching assistant did not provide questions regarding the practical material (responses) before the practical took place.	22 31.4 %	29 41.4 %	11 15.7 %	8 11.4 %	0 0 %	70 100 %
9	The teaching assistant gives preliminary assignments regarding the material to be practiced.	0 0 %	0 0 %	0 0 %	25 35.7 %	45 64.2 %	70 100 %
10	The preliminary and response tasks did not help me understand the practical material that would be carried out.	25 35.7 %	36 51.4 %	2 2.8 %	7 10 %	0 0 %	70 100 %
11	The teaching assistant does not give preliminary assignments regarding the material to be practiced.	20 28.5 %	42 60 %	7 10 %	1 1.4 %	0 0 %	70 100 %
12	I don't understand the animal physiology material after doing the practical work	25 35.7 %	35 50 %	7 10 %	3 4.2 %	0 0 %	70 100 %
13	I am not diligent in making preliminary assignments and animal physiology lab reports	23 32.8 %	25 35.7 %	14 20 %	8 11.4 %	0 0 %	70 100 %
14	I am not challenged to know the results of observations properly and correctly	17 24.2 %	34 48.5 %	14 20 %	3 4.2 %	2 2.8 %	70 100 %
15	The teaching assistant did not provide a brief explanation of the material to be practiced.	10 14.2 %	36 51.4 %	14 20 %	6 8.5 %	4 5.7 %	70 100 %
16	I was not active during the practicum	35 50 %	24 34.2 %	9 12.8 %	2 2.8 %	0 0 %	70 100 %

These factors are the main elements that cause differences in perception among individuals. Each individual has a collection of factors that shape their view of a particular object or stimulus, even if the object is identical. Even though the situation is similar, the perception of individuals or groups can be very different, creating a variety of interpretations of reality. Differences in perception can be found in individual variables such as personality, attitudes, and motivations. Each individual has a unique background that influences how they view the world around them. This creates a complex dynamic in social interactions, where diverse views and judgments become the norm. The process of forming perception basically occurs within a person, but external factors such as life experience, learning processes, and level of knowledge also contribute significantly to how a person perceives an object or stimulus [48]-[50].

Diversity management and improving communication between individuals require a more holistic approach. This involves recognizing and acknowledging differences in individual backgrounds, values, and life

experiences. In addition, a deep understanding of how perceptions are formed through interactions with the environment and society is the foundation for building effective communication bridges. Thus, an inclusive approach to differences in perception can help create an environment that supports the exchange of ideas, appreciates diversity, and strengthens relationships between individuals in this increasingly complex society.

In line with previous research that external and internal factors, be it the environment, human resources, or available facilities, influence individual perceptions and experiences in both different contexts [54]. Then the results of this study are in line with previous studies in terms of the goal of improving students' learning experiences. Both studies underline the importance of the role of teaching assistants and laboratory assistants in assisting students during practicums. Previous studies have shown that inquiry-based guidance increases student motivation and engagement, while the current study shows that the presence and readiness of teaching assistants in assisting practicum groups greatly influences students' perceptions of the quality of practicums [55]. Active involvement of teaching assistants is an important factor in both, although in different contexts. Overall, although previous studies focused on psychological aspects (student motivation and involvement) and the current study focuses more on technical and practical aspects of implementing practicums, both complement each other in an effort to improve students' learning experiences in animal physiology practicums. The alignment of goals to improve the quality of practicums and students' learning experiences is at the heart of both studies, although they take different approaches.

The results of this study indicate the importance of the role of teaching assistants and laboratory assistants in improving the quality of animal physiology practicums in the biology laboratory of Biology Education, Faculty of Tarbiyah and Teacher Education. This study identified several factors that influenced students' perceptions of practicums, including the punctuality of implementation, the availability of adequate facilities, and the active involvement of teaching assistants and laboratory assistants. The novelty of this study is that although teaching assistants are very active in assisting the practicum groups, the punctuality of implementation and the arrival of laboratory assistants are still areas that need to be improved. This study also highlights the need for complete facilities and infrastructure to support the smooth running of practicums.

The implications of this study are the importance of improving punctuality and providing better facilities in the laboratory to improve the quality of the practicum. Improving the competence and readiness of teaching and laboratory assistants in providing better guidance can enrich the learning experience of students and improve understanding of animal physiology materials. In addition, this study suggests further development in the technical and operational aspects of the practicum to create a more conducive environment for the learning process. This study is limited to students' perceptions of the quality of practicums and does not measure the direct impact on students' learning outcomes or academic achievement.

4. CONCLUSION

Based on the results of data analysis and discussion that have been explained previously, the following conclusions can be drawn, student perceptions of the implementation of animal physiology practicums, student perceptions of human resources, completeness of facilities and infrastructure and technical implementation of animal physiology practicums are quite good except for the punctuality of the arrival of the teaching assistant and the start of the practicum, it needs to be more disciplined and the maintenance of laboratory equipment made of glass must be given more attention. In general, factors that greatly influence student perceptions consist of internal factors such as feelings, attitudes, focus, desires and hopes of students and external factors such as information obtained, knowledge and needs around students.

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