

Teachers' and Grade XII Students' Perceptions of Biology Laboratory Facility Utilization in Supporting Biology Learning at Public Senior High Schools in Pattallassang District

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ABSTRAK

Penelitian ini bertujuan mendeskripsikan persepsi pendidik dan peserta didik kelas XII terhadap pemanfaatan fasilitas laboratorium biologi dalam menunjang pembelajaran biologi di SMA Negeri se-Kecamatan Pattallassang. Penelitian menggunakan pendekatan deskriptif kuantitatif dengan teknik pengumpulan data berupa angket tertutup. Sampel penelitian terdiri atas 4 pendidik biologi dan 232 peserta didik kelas XII dari SMA Negeri 2 Takalar dan SMA Negeri 3 Takalar. Data dianalisis menggunakan statistik deskriptif berdasarkan lima aspek, yaitu kelengkapan, kenyamanan, efektivitas penggunaan fasilitas, pelayanan, dan tata ruang laboratorium. Persepsi pendidik dan peserta didik terhadap pemanfaatan fasilitas laboratorium biologi di SMA Negeri se-Kecamatan Pattallassang menunjukkan bahwa indikator kelengkapan, kenyamanan, pelayanan, dan tata ruang berada pada kategori cukup hingga sangat baik, sedangkan efektivitas penggunaan fasilitas laboratorium menjadi indikator yang paling menonjol dengan kategori baik hingga sangat baik. Secara umum, pemanfaatan laboratorium biologi dipersepsikan positif dalam mendukung pembelajaran biologi di sekolah. Temuan ini menegaskan pentingnya optimalisasi fasilitas dan pengelolaan laboratorium berkelanjutan.

ABSTRACT

This study aimed to describe the perceptions of Grade XII biology teachers and students regarding the utilization of biology laboratory facilities in supporting biology learning at public senior high schools in Pattallassang District. A quantitative descriptive approach was employed, with data collected using a closed-ended questionnaire. The study sample consisted of four biology teachers and 232 Grade XII students from SMA Negeri 2 Takalar and SMA Negeri 3 Takalar. The data were analyzed using descriptive statistics based on five aspects: completeness, comfort, effectiveness of facility use, services, and laboratory spatial arrangement. Teachers' and students' perceptions indicated that the aspects of completeness, comfort, services, and spatial arrangement ranged from moderate to very good, while the effectiveness of laboratory facility use emerged as the most prominent aspect, ranging from good to very good. Overall, the utilization of biology laboratories was perceived positively in supporting biology learning at school. These findings highlight the importance of optimizing laboratory facilities and ensuring sustainable laboratory management.

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Introduction

Indonesia continues to face complex educational challenges, including issues related to educational policies, funding, and the education system, as well as the inadequate provision and utilization of educational facilities. These conditions affect the implementation of education at the school level (Afifah, 2017). High-quality education should be supported by adequate learning facilities to ensure that instructional objectives are achieved optimally for students (Niamnule & Halek, 2022). Furthermore, education aims to provide students, as the future generation, with essential knowledge, understanding, and values, which requires appropriate facilities and supporting resources to facilitate effective learning activities (Nelga et al., 2022).

Educational facilities constitute an essential component supporting the implementation of teaching and learning in schools. These facilities include classrooms, instructional media, and laboratories provided by educational institutions to facilitate an optimal learning process (Rahayu & Sutama, 2016). In biology education, laboratories serve as important facilities that enable students to conduct experiments and scientific investigations relevant to the subject matter being studied (Suryana et al., 2024). Through laboratory activities, students are provided with opportunities to apply and empirically verify the theories and concepts they have learned in the classroom (Emda, 2017).

Optimizing the use of biology laboratories enables students to integrate theoretical knowledge with practical experience more effectively. The availability of adequate laboratory facilities plays a fundamental role in achieving the objectives of biology education (Fadlilah et al., 2019). Effective laboratory management and utilization transform the laboratory into both an experimental setting and a learning center that supports the overall biology learning process (Suslistya & Mahadewi, 2023). Biology education also emphasizes the importance of conceptual understanding through scientific processes, such as observation and experimentation. As biology examines organisms at various levels of organization and their interactions with the environment, learning activities should be designed to be applicable and contextually relevant (Niamnule & Halek, 2022). Active participation in laboratory practical activities provides students with opportunities to observe, analyze, and test biological concepts while simultaneously enhancing their conceptual understanding and scientific skills (Riski Aulia et al., 2023).

However, this study was conducted only at SMA Negeri 2 Takalar and SMA Negeri 3 Takalar because the biology laboratory at SMA Negeri 1 Takalar had been converted into a classroom, preventing students from using the laboratory facilities for their intended purposes. Observations at SMA Negeri 2 Takalar and SMA Negeri 3 Takalar indicated that both schools had biology laboratories available for practical activities. Nevertheless, the utilization of laboratory facilities and infrastructure remained suboptimal, as evidenced by several pieces of equipment being

stored outside cabinets, resulting in dirt accumulation and, in some cases, damage. This condition contributed to the irregular implementation of biology practical activities. In addition, the shortage of competent laboratory personnel limited the human resources available for effective laboratory management. These conditions may affect the quality of biology learning in both schools. A lack of awareness and initiative among both teachers and students regarding the use of laboratory facilities also constitutes a barrier to the implementation of practical activities. These findings motivated the researchers to conduct a study entitled perceptions of teachers and grade xii students regarding the utilization of biology laboratory facilities to support biology learning in public senior high schools in pattallassang district.

This study differs from previous research by focusing on teachers' and students' perceptions of the completeness, comfort, effectiveness of use, and spatial arrangement of biology laboratory facilities in supporting the learning process. By involving both teachers and Grade XII students, this study provides a more comprehensive understanding of laboratory facility utilization from the perspectives of those directly engaged in biology learning activities.

Methodology

This study employed a descriptive research design aimed at providing a systematic account of the phenomenon under investigation (Swarjana, 2023). The study incorporated both methodological and disciplinary approaches. The methodological approach was quantitative, emphasizing the collection and analysis of numerical data. Meanwhile, the disciplinary approach adopted was pedagogical, with a focus on educational processes and objectives (Widhi et al., 2021).

The population of this study comprised four Grade XII biology teachers, including one teacher from SMA Negeri 2 Takalar and three teachers from SMA Negeri 3 Takalar. The student population included all Grade XII students enrolled in biology courses at public senior high schools in Pattallassang District, totaling 554 students, consisting of 240 students from SMA Negeri 2 Takalar and 314 students from SMA Negeri 3 Takalar. Simple random sampling was employed to select the study sample. This technique is a basic probability sampling method in which participants are randomly selected from the available population (Hildawati et al., 2024). The sample size was determined using Slovin's formula with a 5% margin of error. Slovin's formula is commonly applied in questionnaire-based research to determine a representative sample size from a given population (Rifkhan, 2023).

The research instrument consisted of questionnaires designed to obtain accurate data by ensuring clarity of language and appropriate question structure, supported by documentation from various written sources. The instruments were validated by two expert validators. The validation results showed that, of the 35 items in the teacher questionnaire, 28 were valid and 7 were invalid, whereas 26 of the 30 items in the student questionnaire were valid and 4 were invalid. Instrument

reliability was assessed using the internal consistency method with Cronbach's alpha, yielding a coefficient of 0.950 for the teacher questionnaire, indicating very high reliability, and 0.848 for the student questionnaire, indicating high reliability. These results demonstrate that the instruments had adequate consistency and stability and were therefore suitable for measuring teachers' and students' perceptions of the utilization of biology laboratory facilities. The questionnaire blueprint used as the basis for instrument development is presented in the following table 1.

Table 1

Questionnaire Blueprint for Teachers' Perceptions of the Utilization of Biology Laboratory Facilities

Variable	Aspect	Indicator	Items	
			Positive	Negative
Teachers' perceptions of the utilization of biology laboratory facilities	Completeness	Availability of biology laboratory equipment	1, 2	3
		Availability of materials/specimens, practical manuals, and technological facilities that support biology learning in the laboratory	4, 5	6, 7
		Quality and condition of laboratory equipment	8	9
	Comfort	Laboratory cleanliness	10	11
		Adequate lighting and ventilation	12, 13	14
		Availability of adequate and comfortable tables and chairs	15	16
		Comfortable room temperature	17	18
	Effectiveness of Laboratory	Time efficiency in the use of laboratory facilities	19	20
		Facility Use Services	Impact of labor atory facility use	21, 22
	Assistance and support provided by teachers and laboratory personnel in giving instructions		24	25
	Clear laboratory administrative system		28, 29	26, 27
	Spatial Arrangement	Efficient arrangement of tables and laboratory equipment	30	31
		Availability of adequate space for movement	32	33
		Availability of adequate storage space	34	35
		Total	35	

Table 2

Questionnaire Blueprint for Students' Perceptions of the Utilization of Biology Laboratory Facilities

Variable	Aspect	Indicator	Items	
			Positive	Negative
Students' Perceptions of the Utilization of Biology	Completeness	Availability of biology laboratory equipment	1	2
		Availability of materials/specimens, practical manuals, and technological facilities that support biology learning in the laboratory	3, 4	5

Variable	Aspect	Indicator	Items	
			Positive	Negative
Laboratory Facilities		Quality and condition of laboratory equipment	6	7
		Laboratory cleanliness	8	9
		Adequate lighting and ventilation	10	11
	Comfort	Availability of adequate and comfortable tables and chairs	12	13
		Comfortable room temperature	14	15
	Effectiveness of Laboratory Facility Use	Time efficiency in the use of laboratory facilities	16	17
		Impact of laboratory facility use	18, 19	20
	Services	Assistance and support provided by teachers and laboratory personnel in giving instructions	21	22
		Clear laboratory administrative system	23	24
	Spatial Arrangement	Efficient arrangement of tables and laboratory equipment	25	26
		Availability of adequate space for movement	27	28
		Availability of adequate storage space	29	30
Total			30	

The data obtained were analyzed using descriptive statistical techniques to provide a systematic description, overview, and interpretation of the dataset (Sudaryono, 2021). The data analysis involved calculating the mean, median, mode, and standard deviation. In addition, the tendency of each variable was analyzed by classifying the scores into five categories. Table 3 presents the categorization based on the level of variable tendency. The categorization was determined using the following calculations (Ghodang, 2020):

$$Mi = \frac{\text{Ideal Maximum Score} + \text{Ideal Minimum Score}}{2}$$

$$SDi = \frac{\text{Ideal Maximum Score} - \text{Ideal Minimum Score}}{6}$$

Note:

Mi : Ideal mean

SDi : Ideal standard deviation

Table 3
Categories of Variable Tendency Levels

Interval	Category
$X > Mi + 1,5 SDi$	Very Good
$Mi + 0,5 SDi < X \leq Mi + 1,5 SDi$	Good
$Mi - 0,5 SDi < X \leq Mi + 0,5 SDi$	Moderate
$Mi - 1,5 SDi < X \leq Mi - 0,5 SDi$	Poor
$X \leq Mi - 1,5 SDi$	Very Poor

The percentage of the data was calculated using the general percentage formula, as follows (Didi, 2016):

$$P = \frac{f}{N} \times 100\%$$

Note:

- P : Percentage value
 F : Frequency of the responses being calculated
 N : Total number of respondents

Results and Discussion

The data for this study were obtained through questionnaires completed by Grade XII biology teachers and students at public senior high schools in Pattalassang District. The analysis of teachers' and students' perceptions regarding the utilization of biology laboratory facilities in supporting biology learning at school is presented in the following Table 4.

Table 4
Description of Teachers' and Students' Perceptions

No.	Indicator	SMAN 2 Takalar – Teachers	SMAN 2 Takalar – Students	SMAN 3 Takalar – Teachers	SMAN 3 Takalar – Students
1	Completeness	Very Good. Teachers perceived that the availability, quality, and condition of laboratory equipment, materials/specimens, practical manuals, and technological facilities strongly supported the learning process.	Good. Mean = 17.65; score percentage = 73.54%. A total of 59% of students were classified in the good category and 16% in the very good category.	Moderate. Mean = 17.66; score percentage = 63.07%. Teachers' assessments varied considerably, with 33.33% classified as very good, 33.33% as moderate, and 33.33% as very poor.	Moderate. Mean = 15.97; score percentage = 66.54%. The largest proportion of students, 47.7%, was classified in the moderate category.
2	Comfort	Good. Teachers perceived that laboratory cleanliness, lighting, ventilation, tables and chairs, and room temperature were generally supportive of learning activities.	Good. Mean = 20.07; score percentage = 71.67%. A total of 41% of students were classified as good and 21% as very good.	Moderate. Mean = 15.66; score percentage = 65.25%. Two of the three teachers were classified in the good category, whereas one teacher provided a very poor assessment.	Moderate. Mean = 18.93; score percentage = 67.60%. A total of 46.2% of students were classified as moderate and 34.1% as good.
3	Effectiveness of Laboratory Facility Use	Good. Teachers perceived the laboratory facilities as sufficiently effective in supporting experiments relevant to the subject matter and in facilitating the organization of practical activities.	Very Good. Mean = 9.57; score percentage = 79.75%. A total of 99% of students were classified in the very good category based on the categorization intervals used in this study.	Good. Mean = 11.00; score percentage = 68.75%. Teachers perceived that the use of the laboratory supported experiment-based learning.	Very Good. Mean = 9.09; score percentage = 75.75%. A total of 98.5% of students were classified in the very good category based on the study's categorization criteria.
4	Services	Good. Laboratory services related to assistance during practical activities, scheduling, administration, and the organization of laboratory activities were rated positively by teachers.	Good. Mean = 12.01; score percentage = 75.06%. A total of 52% of students were classified as good and 34% as very good.	Moderate. Mean = 14.00; score percentage = 58.33%. Teachers' assessments were heterogeneous, ranging from very good to very poor.	Moderate. Mean = 10.93; score percentage = 68.31%. Although 52.3% of respondents were classified in the good category, the mean score fell within the moderate category according

No.	Indicator	SMAN 2 Takalar – Teachers	SMAN 2 Takalar – Students	SMAN 3 Takalar – Teachers	SMAN 3 Takalar – Students
5	Spatial Arrangement	Very Good. Teachers perceived that the arrangement of laboratory tables, movement space, and storage areas strongly supported the implementation of laboratory activities.	Good. Mean = 19.16; score percentage = 79.83%. A total of 47% of respondents were classified as very good and 42% as good, while the mean score fell within the good category.	Moderate. Mean = 13.33; score percentage = 66.65%. The assessments of the three teachers were distributed across the very good, good, and very poor categories.	to the intervals used in this study. Good. Mean = 16.89; score percentage = 70.37%. A total of 47% of students were classified in the good category and 35.7% in the moderate category.

The findings indicate that Grade XII teachers and students at public senior high schools in Pattalassang District generally held positive perceptions of the utilization of biology laboratories. The assessment focused on five key aspects: facility completeness, comfort, effectiveness of use, service quality, and laboratory spatial arrangement. Overall, the questionnaire data suggest that biology laboratories have been utilized effectively to support the learning process. The laboratory functions not merely as a venue for practical activities but also as a setting for experiential learning. Such optimal utilization contributes to improving the quality of the learning process, as reflected in respondents' assessments, which predominantly fell within the good to very good categories.

Regarding the completeness of biology laboratory facilities, teachers rated this aspect in the very good category, whereas students rated it in the good category. This difference indicates a divergence in perspectives between teachers and students. Teachers tend to evaluate facility completeness based on its alignment with curriculum requirements and instructional needs, whereas students assess it primarily through their direct experiences of using laboratory equipment and materials during practical activities. This finding is consistent with the view that the completeness of laboratory facilities is a key component of laboratory effectiveness because it directly influences students' level of participation in practical activities (Syah et al., 2025). It also supports the perspective that the availability of adequate facilities and infrastructure constitutes an essential element in the success of the learning process (Saputri et al., 2025).

Regarding the comfort of biology laboratories, teachers rated this aspect in the good category, whereas students rated it in the moderate category. Laboratory comfort was reflected in the availability of adequate tables and chairs, well-maintained cleanliness, sufficient lighting, and stable room temperature. A comfortable laboratory environment contributes to the creation of a conducive learning atmosphere and facilitates effective interaction between teachers and students. From the students' perspective, the comfort of the learning environment also plays an important role in enhancing focus and concentration during practical activities. Clean laboratory conditions, adequate lighting, proper ventilation, and stable room temperature are therefore important factors supporting an effective learning process. This finding is consistent with the view that optimal lighting and ventilation are essential components of an ideal learning environment (Palupi et al., 2025). It also supports the perspective that the physical characteristics of learning spaces play an important role in promoting students' comfort and concentration throughout the learning process (Dharmayanti et al., 2017).

Regarding the effectiveness of laboratory facility utilization, both teachers and students rated this aspect in the very good category. This indicates that experiment-based biology learning has been implemented effectively and is well aligned with the subject matter being taught. From the teachers' perspective, practical activities were considered effective in deepening students' understanding of biological concepts, supported by well-planned schedules and appropriate time

management that enabled more optimal use of laboratory equipment and materials. Meanwhile, students perceived laboratory-based learning as well organized, relevant to classroom content, and supported by systematic practical schedules that did not interfere with other learning activities. These conditions reflect effective laboratory management by the schools. The findings are consistent with the view that experimental methods play an important role in improving the quality of students' learning processes (Syahrial et al., 2025), as well as with the perspective that practical activities are essential for helping students verify scientific concepts and achieve intended learning objectives (Ahdila & Masykuri, 2022).

The analysis showed that, with regard to biology laboratory services, teachers rated this aspect in the moderate category, whereas students rated it in the good category. The services provided by laboratory personnel and teachers were considered to support the smooth implementation of practical activities through the availability of laboratory staff, a well-organized administrative system, and clearly structured practical schedules. This condition reflects effective coordination, which helps minimize technical constraints during the learning process.

Regarding the spatial arrangement of the laboratory, teachers rated this aspect in the very good category, while students rated it in the good category. A spacious laboratory, efficient arrangement of practical worktables, and well-organized storage areas provide students with sufficient freedom of movement and facilitate access to laboratory equipment and materials. This finding is consistent with the view that laboratory services and spatial arrangement play an important role in creating a safe, effective, and high-quality learning environment (Suslistya & Mahadewi, 2023). It also supports the perspective that effective laboratory management, including appropriate spatial organization, is essential for improving the effectiveness and quality of practical activities (Purba, 2023).

Conclusion

Berdasarkan hasil penelitian, persepsi pendidik dan peserta didik kelas XII terhadap pemanfaatan fasilitas laboratorium biologi di SMA Negeri se-Kecamatan Pattallasang menunjukkan adanya perbedaan antara SMA Negeri 2 Takalar dan SMA Negeri 3 Takalar. Secara umum, SMA Negeri 2 Takalar memperoleh penilaian yang lebih positif. Pendidik menilai aspek kelengkapan dan tata ruang dalam kategori sangat baik, sedangkan kenyamanan, efektivitas penggunaan fasilitas laboratorium, dan pelayanan berada pada kategori baik. Persepsi peserta didik di SMA Negeri 2 Takalar juga cenderung positif, dengan aspek kelengkapan, kenyamanan, pelayanan, dan tata ruang berada pada kategori baik, sementara efektivitas penggunaan fasilitas laboratorium berada pada kategori sangat baik. Sementara itu, di SMA Negeri 3 Takalar, persepsi pendidik terhadap aspek kelengkapan, kenyamanan, pelayanan, dan tata ruang berada pada kategori cukup, sedangkan efektivitas penggunaan fasilitas laboratorium berada pada kategori baik. Persepsi

peserta didik menunjukkan bahwa kelengkapan, kenyamanan, dan pelayanan berada pada kategori cukup, tata ruang berada pada kategori baik, dan efektivitas penggunaan fasilitas laboratorium berada pada kategori sangat baik. Dengan demikian, efektivitas penggunaan fasilitas laboratorium merupakan aspek yang memperoleh penilaian paling positif pada kedua sekolah, sedangkan kelengkapan, kenyamanan, dan pelayanan menjadi aspek yang masih perlu mendapat perhatian lebih, khususnya di SMA Negeri 3 Takalar.

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