



Analysis of Students Biology Learning Difficulties in Senior High School

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Abstract: This study is a survey study that aims to determine the biology topics that are difficult for students and teachers, the types of biology learning difficulties and how to overcome the biology learning difficulties of high school students in Palopo City. This research was conducted at all State Senior High Schools (SMA) in Palopo City. Data collection techniques using questionnaire techniques. Data were analysed quantitatively and qualitatively. The results of the study showed that the top 5 difficult biology topics for senior high school students in Palopo City were heredity, coordination system, circulatory system, genetic substance, mitosis and meiosis. While the biology topics that were difficult for students based on the perceptions of biology teachers of State Senior High Schools in Palopo City were metabolism. The types of biology learning difficulties experienced by students include various factors including student characteristics, teaching methods, and environmental limitations. From the various obstacles in learning biology experienced by students, solutions are needed to overcome them. Ways to overcome difficulties in learning biology according to students include suggested solutions involve improving teaching strategies, adjusting the curriculum, and increasing school support.

Keywords: Biology; Learning Difficulties; Senior High School; Students

Introduction

The low quality of education in Indonesia cannot be separated from the learning process in schools. The learning process at school is a complicated process because it is not just absorbing information from the teacher, but involves various activities and actions that must be carried out, especially if good learning outcomes are desired (Sariani et al., 2021). Learning outcomes and students' attitudes not only have a relationship with the learning environment, but also have a relationship with the teacher's interpersonal behaviour in the classroom, one of which is teaching style, media, and evaluation (Zaim et al., 2019). Thus, it cannot be denied that the difficulty and effectiveness of students' learning is also influenced by the teacher's

competence in transforming knowledge in the classroom.

In the learning process at school, one of the difficult subjects is biology (Azizah & Alberida, 2021). Learning difficulties affect students' learning achievement. In addition, difficulties make learners less motivated to learn biology. As a result, it is difficult for them to achieve good results from their studies (Ferry & others, 2024; Sani et al., 2021).

According to Cimer (2012) that teaching styles, methods and techniques of teachers in teaching biology are also factors that influence students in learning biology, understanding students' perceptions of learning biology effectively is also very important, because many researchers suggest that to improve the quality of learning in schools, students' perceptions

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should be one of the considerations by researchers, teacher educators, schools and teachers.

There are several topics in biology that are difficult for students to learn, including genetics. This is due to the language and terms in genetics, the mathematical content in it, the general attitude of learners, the symbols in genetics, domain-specific terminology and vocabulary, cytological processes, the abstract nature of the subject and the complex nature of genetics (Ardiansyah et al., 2016; Lidi & Daud, 2019; Maghfiroh & Susantini, 2023; Zubaidah, 2019).

Based on the results of interviews conducted by researchers to all public high school biology teachers in Palopo City, information was obtained that there are several biology topics that are considered difficult to transform and teach to students. Some topics that are considered difficult are metabolism, immune system, circulatory system, coordination system, mutation and evolution, inheritance of traits, and membrane transport. The learning difficulties experienced by students are due to the lack of basic concepts of students in understanding and analysing biological material, so that students have difficulty distinguishing, analysing and concluding. For example, in metabolic material, students must know basic chemical concepts about ATP, enzymes and their role, compounds and so on. In addition, students also have difficulty learning biology because in biology subjects use a lot of Latin and terms that are rarely heard in the ears of students so that the language sounds foreign to students.

Other learning difficulties experienced are that students do not have basic conceptual knowledge in biology, the level of application of students is very low, they do not know how to apply knowledge in everyday life and also the attitude of students towards biology teachers (Oyekan, 2015).

It is expected that the findings in this study can be a valuable contribution for teachers, schools, and policy makers in designing better biology learning based on the biology learning difficulties experienced by students. The results of this study are expected to be a valuable source of information for education practitioners, especially in the field of biology, in realizing biology learning to be meaningful and effective learning.

Method

This study is a survey study with a population of all students of class XII IPA and all biology teachers at State Senior High Schools in Palopo City. The total number of samples is 215 people consisting of 192 students selected based on class randomly stratified. There are 23 biology teachers which is the total number of biology teachers at State Senior High Schools in Palopo City.

The instrument used in this study was a questionnaire. The questionnaire was used to collect data on biology topics that were difficult for students, biology learning difficulties experienced by students, how to overcome biology learning difficulties for students and biology topics that were difficult for students based on the perception of biology teachers. Separate questionnaires for teachers and for students. This questionnaire is a mixed questionnaire. Questionnaire for students, There are 19 questions related to the difficulty of biology topics in a closed manner and 19 questions about the reasons for experiencing learning difficulties in an open manner and there is 1 mixed questionnaire related to how to overcome biology learning difficulties. The questionnaire for teachers is a closed questionnaire consisting of 19 questions about difficult topics. All questionnaires were validated by 2 expert validators of material and constructs before being used.

Result and Discussion

Results of data analysis on difficult biology topics for high school students in Palopo City

The data obtained from giving questionnaires to students were analyzed quantitatively. The percentage of difficulty categories was calculated from the accumulation of frequencies of each category in each topic. The determination of the difficulty category was determined by the highest percentage of the existing difficulty categories. There was 1 biology topic out of 19 topics that had not been studied by two schools, namely the topic of biotechnology at SMA Negeri 2 Palopo and SMA Negeri 5 Palopo. The topic of biotechnology was not studied by students at SMA Negeri 2 Palopo and SMA Negeri 5 Palopo because the material running in the school had not yet included biotechnology material. The categorization and percentage of difficulty of biology topics by SMA Negeri students in Palopo City can be seen in Table 1.

Based on Table 1 shows that of the 19 biology topics, there are top 5 topics that fall into the category of topics that are difficult to learn and understand by high school students in Palopo City namely heredity, coordination system, circulation system, genetic substance, mitosis and meiosis each with a percentage of difficulty of 43.2%, 42.2%, 38.5%, 38.5%, and 33.9% of the frequency of students who consider difficult. Then there are 13 topics that fall into the medium category, namely the topics of cells, plant tissues, animal tissues, movement systems, food and digestive systems, respiratory systems, excretory systems, reproductive systems, immune systems, metabolism, mutations, evolution and biotechnology.

Table 1. Categorisation and Percentage of Biology Topic Difficulties by Learners of State High Schools in Palopo City

Biology Topics	Difficulty category of public senior high schools in Palopo City						Difficulty Category	Difficulty Percentage (%)			
	1	2	3	4	5	6		Easy	Medium	Difficult	Not learnt
Cell	Medium	Medium	Medium	Medium	Medium	Medium	Medium	14.1	79.2	6.7	-
Plant Tissue	Medium	Medium	Medium	Medium	Medium	Medium	Medium	14.1	69.8	16.1	-
Animal Tissue	Medium	Medium	Medium	Medium	Medium	Medium	Medium	16.1	63.6	19.8	0.5
Motion System	Medium	Medium	Medium	Medium	Medium	Medium	Medium	30.7	52.6	16.7	-
Circulation System	Medium	Medium	Medium	Difficult	Medium	Difficult	Medium	8.8	48.4	38.6	4.2
Food & Digestive System	Easy	Easy	easy	Medium	Medium	Medium	Medium	43.8	45.3	8.8	2.1
Respiratory System	Medium	Easy	Medium	Medium	Medium	Easy	Medium	35.9	50.6	13	0.5
Excretory System	Medium	Medium	Medium	Medium	Medium	Medium	Medium	26.0	55.2	17.7	1
Coordination System	Difficult	Medium	Medium	Difficult	Medium	Difficult	Medium	13.5	43.8	42.2	0.5
Reproductive System	Easy	Easy	Medium	Medium	Medium	Medium	Medium	39.1	48.4	12.5	-
Immune System	Medium	Medium	Medium	Difficult	Medium	Difficult	Medium	16.7	39	25.5	18.8
Growth & Development	Easy	Easy	Easy	Easy	Easy	Medium	Easy	48.4	39.1	12	0.5
Metabolism	Medium	Medium	Medium	Medium	Medium	Medium	Medium	20.8	52.6	25	1.6
Genetic Substance	Medium	Medium	Medium	Difficult	Medium	Difficult	Medium	16.7	44.3	38.5	0.5
Mitosis & Meiosis	Medium	Medium	Medium	Difficult	Medium	Difficult	Medium	17.2	47.9	33.9	1
Heredity	Medium	Difficult	Medium	Difficult	Difficult	Difficult	Difficult	10.9	39.6	43.2	6.3
Mutations	Easy	Medium	Medium	Medium	Medium	Difficult	Medium	26.5	43.8	21.9	7.8
Evolution	Easy	Medium	Medium	Medium	Medium	Medium	Medium	24	45.8	17.7	12.5
Biotechnology	Medium	Not yet learnt	Medium	Difficult	Not yet learnt	Difficult	Medium	16.1	26.0	17.7	40.1

There is 1 topic that falls into the category of easy to learn and understand by high school students in Palopo City, namely growth and development at 48.4% of the frequency of students who consider it easy. On the topic of the immune system, the percentage of students who did not learn it was 18.8% because the time was too short and not enough to teach the material so that sometimes teachers only taught it briefly and even only gave assignments to students without explaining the material at all.

Results of data analysis of biology learning difficulties experienced by public high school students in Palopo city

There are several factors that influence students' biology learning difficulties then arranged into main categories consisting of several sub-categories. Respondents chose and reported more than one reason for the difficulties experienced in learning biology, so the cumulative number was greater than the number of respondents in the study. The results of data analysis of biology learning difficulties on the topic of cells experienced by public high school students in Palopo City can be seen in Table 2.

Table. 2 Reasons for Students Experiencing Biology Learning Difficulties at State Senior High Schools in Palopo City.

Biology Topics	Difficulty Category	F*
1.Cell	Topic characteristics	284
	Biology teacher's teaching style	73
	Learners' study habits	84
	Learners' feelings and attitudes towards the topic	51
	Lack of resources	90
	Economic and psychological conditions of learners	2

Biology Topics	Difficulty Category	F*
Total		584
2.Plant Tissue	Topic characteristics	251
	Biology teacher's teaching style	65
	Learners' study habits	85
	Learners' feelings and attitudes towards the topic	58
	Lack of resources	100
	Learners' psychological condition	1
Total		559
3.Animal Tissue	Topic characteristics	260
	Biology teacher's teaching style	63
	Learners' study habits	64
	Learners' feelings and attitudes towards the topic	65
	Lack of resources	89
Total		541
4.Motion System	Topic characteristics	230
	Biology teacher's teaching style	54
	Learners' study habits	47
	Learners' feelings and attitudes towards the topic	42
	Lack of resources	65
Total		438
5.Circulation System	Topic characteristics	288
	Biology teacher's teaching style	53
	Learners' study habits	72
	Learners' feelings and attitudes towards the topic	61
	Lack of resources	101
Total		575
6.Food and the Digestive System	Topic characteristics	163
	Biology teacher's teaching style	32
	Learners' study habits	31
	Learners' feelings and attitudes towards the topic	32
	Lack of resources	66
Total		324
7.Respiratory System	Topic characteristics	176
	Biology teacher's teaching style	53
	Learners' study habits	49
	Learners' feelings and attitudes towards the topic	37
	Lack of resources	76
Total		391
8.Excretory System	Topic characteristics	233
	Biology teacher's teaching style	46
	Learners' study habits	63
	Learners' feelings and attitudes towards the topic	38
	Lack of resources	76
Total		456
9.Coordination System	Topic characteristics	288
	Biology teacher's teaching style	69
	Learners' study habits	68
	Learners' feelings and attitudes towards the topic	61
	Lack of resources	73
Total		559
10. Reproductive System	Topic characteristics	183
	Biology teacher's teaching style	54
	Learners' study habits	53
	Learners' feelings and attitudes towards the topic	42
	Lack of resources	55
Total		387
11. Immune System	Topic characteristics	194
	Biology teacher's teaching style	56
	Learners' study habits	57
	Learners' feelings and attitudes towards the topic	46
	Lack of resources	54
Total		407

Biology Topics	Difficulty Category	F*
12. Growth and Development	Topic characteristics	130
	Biology teacher's teaching style	42
	Learners' study habits	46
	Learners' feelings and attitudes towards the topic	47
	Lack of resources	55
Total		320
13. Metabolism	Topic characteristics	257
	Biology teacher's teaching style	75
	Learners' study habits	61
	Learners' feelings and attitudes towards the topic	59
	Lack of resources	76
	Physical condition of learners	1
Total		529
14. Genetic Substance	Topic characteristics	285
	Biology teacher's teaching style	80
	Learners' study habits	66
	Learners' feelings and attitudes towards the topic	60
	Lack of resources	74
	Learners' assessment of the teacher	1
Total		566
15. Mitosis and Meiosis	Topic characteristics	242
	Biology teacher's teaching style	74
	Learners' study habits	66
	Learners' feelings and attitudes towards the topic	71
	Lack of resources	79
	Physical condition of learners	1
Total		533
16. Heredity	Topic characteristics	275
	Biology teacher's teaching style	68
	Learners' study habits	65
	Learners' feelings and attitudes towards the topic	74
	Lack of resources	88
Total		570
17. Mutations	Topic characteristics	194
	Biology teacher's teaching style	62
	Learners' study habits	50
	Learners' feelings and attitudes towards the topic	59
	Lack of resources	64
	Physical condition of learners	1
Total		430
18. Evolution	Topic characteristics	166
	Biology teacher's teaching style	68
	Learners' study habits	48
	Learners' feelings and attitudes towards the topic	55
	Lack of resources	64
	Physical condition of learners	2
Total		403
19. Biotechnology	Topic characteristics	147
	Biology teacher's teaching style	34
	Learners' study habits	38
	Learners' feelings and attitudes towards the topic	42
	Lack of resources	56
Total		317

Based on Table 2, shows that students experience biology learning difficulties in more than one aspect. Learners choose more than one type of biology learning difficulty they experience. biology learning difficulties experienced by learners on each topic have many similarities. The types of biology learning difficulties

experienced by learners include Characteristics of topics such as complicated and abstract topics; Less creative teaching style of biology teacher; Undisciplined learning habits of learners; learners' negative feelings and attitudes towards the topic; lack of resources and time;

learners' economic, psychological and physical conditions.
that are not supportive; Learners' negative judgement of the teacher.

Results of data analysis of biology learning difficulties experienced by public high school students in Palopo city

The ways of overcoming learning difficulties by students vary, this is influenced by the types of learning

difficulties experienced by students. Respondents chose and reported more than one way to overcome biology learning difficulties, the cumulative number was greater than the number of respondents in the study. The results of data analysis on how to overcome biology learning difficulties experienced by public high school students in Palopo City can be seen in Table 3 and Table 4.

Table 3. Ways to Overcome Biology Learning Difficulties of Public High School Students in Palopo City based on the choices in the questionnaire

Main Category	Sub Categories	Example of a Learner Quote	F*
1.Make the lesson interesting	Creating an easy way to memorise	Teachers should provide tips on how to memorise easily.	1
	Introduce and familiarise students with Latin names	The teacher introduces and familiarises the Latin names to the students to make them more familiar	2
2.Paying attention to curriculum content	Biology material is too much and dense	Biology material is too much and dense in the curriculum so it should be reduced.	5
			6
3.Learners have readiness and disciplined learning habits	Have a study group	Have a study group to exchange ideas	9
			6
	Increase interest in reading	Students should be diligent in reading	1
	Have a disciplined study habit	Students must be disciplined and quiet	1
			0
4.Teaching biology by relating the topic to everyday life	Connecting the topic to everyday life		1
		The topic of study should be relevant to everyday life to make it easier to understand.	6
			5

Table 4. Ways to Overcome Biology Learning Difficulties of Public High School Students in Palopo City Based on Respondents' Open Answers to Questionnaires

Main Category	Sub Categories	Example of a Learner Quote	F*
1.Teaching biology through practical work	More practicum	We have to do a lot of practicum so that we can understand the material more easily.	33
2.The school provides facilities	Study in an open space	Study in an open space once in a while	2
	Provide learning facilities	The school prepares and completes facilities for learning such as LCD and lab equipment.	24
	Provide learning resource facilities (books etc.)	Increase the availability of books as a source of knowledge	1
	Provide classroom facilities	The classroom should have air conditioning so that when learning in the classroom is not hot	1
3.Improve teachers' teaching abilities and classroom management skills	Teachers must be more creative	Teachers must be more creative so that students who are taught can enjoy and	163
	Teachers should better understand learners' potential	Teachers must understand students by looking at students' abilities	1
	Teachers are not value-orientated	Teachers should look at students' ability based on their daily performance without paying attention to the final score.	1
	The teacher motivates learners	Teachers should motivate students and not use bad words such as stupid, бага and beleng (Luwu language means stupid).	1
	Teachers are better at mastering the material	Teachers should be more familiar with the material	2
	Organise learners' seating	Students who are difficult to understand should sit at the front of the room.	1
	The teacher gives a reward	The teacher gives prizes or awards to students who get good test scores	1

Main Category	Sub Categories	Example of a Learner Quote	F*
4.Regulatory policies in schools	Not overloading learners with too many tasks	The assignment should be reduced because there are still many assignments from other lessons that must be completed quickly.	9
	Conduct an evaluation	After providing the material, an evaluation should be carried out	3
	Reduced study hours	Study hours should be reduced	1
	Allowing mobile phones to be brought to school	It should not be forbidden to bring mobile phones to school	1

Based on the results of data analysis on how to overcome biology learning difficulties by students, there are 8 ways to overcome biology learning difficulties experienced by students, namely Teachers should make learning interesting; The government and teachers should pay attention to the content of the curriculum because the biology material is too much and dense; Teachers should teach biology through practical activities; Learners should have readiness and disciplined learning habits; Teachers should teach biology by connecting topics with everyday life; Schools should provide facilities, especially providing learning facilities such as LCDs, lab equipment, etc.; Teachers' teaching abilities and classroom management skills should be improved. Teachers' teaching abilities and classroom management skills should be improved; School policies should pay more attention to the interests and needs of students.

Results of data analysis on biology topics that are difficult for students based on the perceptions of public high school biology teachers in Palopo city

Several factors such as the condition of students, class and school environment, the completeness of school facilities and the qualifications of biology teachers in each school vary, making the answers of biology teachers in public high schools in Palopo City vary. In addition, there are some biology teachers who have never taught biology topics in class XII IPA. This is because the teacher was not assigned to teach these topics. The results of data analysis on biology topics that are difficult for students based on the perceptions of biology teachers at public high schools in Palopo City can be seen in Table 5.

Table 5. Categorisation of Biology Topic Difficulties for Learners Based on Perceptions of Biology Teachers in Public High Schools in Palopo City

Biology Topics	Difficulty Category	Difficulty Percentage (%)			
		Easy	Medium	Difficult	Not taught
Cell	Medium	30.4	56.5	8.7	4.3
Plant Tissue	Medium	21.7	56.5	8.7	13
Animal Tissue	Medium	8.7	73.9	8.7	8.7
Motion System	Medium	17.4	69.6	4.3	8.7
Circulation System	Medium	8.7	65.2	13	13
Food & Digestive System	Medium	34.8	56.5	-	8.7
Respiratory System	Medium	17.4	69.6	4.3	8.7
Excretory System	Medium	13	73.9	4.3	8.7
Coordination System	Medium	-	69.6	17.4	13
Reproductive System	Medium	8.7	65.2	17.4	8.7
Immune System	Medium	13	60.9	13	13
Growth & Development	Easy	47.8	30.4	-	21.7
Metabolism	Difficult	4.3	21.7	52.2	21.7
Genetic Substance	Medium	4.3	52.2	21.7	21.7
Mitosis & Meiosis	Medium	17.4	43.5	17.4	21.7
Heredity	Medium	4.3	60.9	13	21.7
Mutations	Medium	8.7	65.2	4.3	21.7
Evolution	Medium	13	56.5	8.7	21.7
Biotechnology	Medium	13	60.9	4.3	21.7

Based on Table 5 shows that of the 19 biology topics, there is 1 topic that falls into the category of topics that are difficult to learn and understand by high school students in Palopo City, namely metabolism as much as 52.2% of students who consider it difficult. Then there

are 17 topics that fall into the moderate category, namely the topics of cells, plant tissues, animal tissues, movement systems, circulatory systems, food and digestive systems, respiratory systems, excretory systems, coordination systems, reproductive systems,

immune systems, heredity, genetic substances, mitosis and meiosis, mutations, evolution and biotechnology. And there is 1 topic that falls into the category of easy to learn and understand by students based on the perceptions of biology teachers of SMAN in Palopo City, namely growth and development as much as 47.8% of students who consider it easy.

Discussion

The results showed that difficult biology topics based on students' perceptions were the topics of heredity, coordination system, circulatory system, genetic substance, mitosis and meiosis. This is different from the results of research on biology topics that are difficult for students based on the perception of biology teachers, namely metabolism as a difficult topic.

The difference in perception between students and teachers shows a discrepancy in assessing the difficulty of biology materials; students consider heredity, coordination system, circulation, genetic substance, mitosis, and meiosis as difficult topics because they are related to the abstract level and high conceptual understanding. Meanwhile, teachers tend to see metabolism as the most difficult topic, due to the complexity of biochemical processes that require integration of concepts across topics.

This is in line with the results of research by Ozcan et al. (2014) that topics that are difficult for students are the topic of heredity (Adrianto et al., 2023; Hariyadi, 2018; Mardin et al., 2023; Zahwa & Isnawati, 2020), the circulatory system (Adrianto et al., 2024; Lakapu, 2023), the substance of genetics ((Anjani, 2022), mitosis and meiosis (Iryanti & Puspitawati, 2021) because the material is too complicated, detailed, difficult, has mathematical content in it and memorisation. In addition, students' own factors (not attending lessons, not learning, not able to understand, not interested in the topic) and teacher factors (not attending, not instructing well, fast in teaching) are factors of difficulty for students in learning biology (Katili et al., 2024; Simanjuntank, 2021) including the lack of attractive learning media used also affects students' learning outcomes (Yusuf et al., 2023). Materials that are considered difficult are the nervous system and genetics. These topics are difficult because of the high school curriculum, learning strategies in schools, inadequate textbooks, insufficient laboratory equipment, low motivation and interest of learners because the subject is not relevant to everyday life (Ayundari & Manalu, 2024; Firdaus et al., 2024; Lestari, 2016).

The topic of metabolism is considered difficult for students based on the perception of public high school biology teachers in Palopo City, this is in line with the research of Abdillah (2022); Muspikawijaya et al. (2017) that the difficulty of applying metabolic material is because the material is classified as difficult and abstract.

Teachers and learners have the same perception that the topic of growth and development is an easy topic. This is due to the practicum on this topic carried out by teachers and students so that it is hoped that for the explanation of the topic of growth and development, practicum activities should be carried out so that students can more easily understand the topic (Pradina & Yuliani, 2020; Zahroh & Yuliani, 2021).

In Table 1, there is a similar response pattern from public high school students in Palopo city towards the topics of circulatory system, immune system, genetic substance, mitosis and meiosis. The 4 topics together are categorised as moderate by SMA A, SMA B, SMA C and SMA E. While SMA D and SMA F categorise these topics into the difficult category. This is related to the reasons for learning difficulties experienced by students in each school. Good teacher qualifications and supported by adequate facilities and infrastructure such as complete laboratories, clean school environment and discipline in SMA A, SMA B, SMA C and SMA E.

In addition, in Table 1, SMA A, SMA B, SMA C and SMA E on average stated biology topics as topics with difficulty in the medium category, while SMA D and SMA F respectively stated that there were 7 and 8 topics that fell into the difficult category. This is due to the condition and atmosphere of SMA A, SMA B, SMA C and SMA E schools which are conducive, comfortable, neat and disciplined, complete laboratory equipment, even having 3 laboratories namely biology laboratory, chemistry laboratory and physics laboratory. As well as the qualifications of biology teachers who are experienced and have a Master's degree, making classroom learning more interesting and meaningful. The selection of new students in SMA A, SMA B and SMA C is very strict. In contrast to the conditions that exist in SMA D and SMA F, the school environment is undisciplined, teachers who do not have good qualifications, rarely participate in academic and non-academic training, and the attitude of teachers who make students unsympathetic. SMA F is still relatively new because the school is only 7 years old compared to other schools that have been around for a long time. Inadequate facilities and infrastructure such as laboratory facilities.

Based on the results obtained, it shows that students experience biology learning difficulties in more than one aspect. Learners choose more than one type of biology learning difficulty that they experience. biology learning difficulties experienced by learners on each topic have many similarities. The types of biology learning difficulties experienced by learners include: Characteristics of topics such as complicated and abstract topics; Less creative teaching style of biology teacher; Undisciplined learning habits of learners; Learners' negative feelings and attitudes towards the topic; lack of resources and time; learners' unfavourable

economic, psychological and physical conditions; learners' negative assessment of the teacher. Learners' negative judgement towards the teacher.

The above is in line with the results of research by Cimer (2012) that biology learning difficulties experienced by grade XI students from 207 samples spread across four high schools in Turkey include the characteristics of the topic, the teaching style of biology teachers, students' learning habits, students' feelings and attitudes towards the topic and lack of resources and time.

Another difficulty is the teaching method of biology teachers who are not creative, monotonous using only one or two teaching methods such as lecture and discussion methods in class. In addition, the attitude of the biology teacher that makes students become unsympathetic to the teacher. The teacher often said inappropriate words that made students discouraged in learning, shy and afraid to ask questions and confined the creativity of students. This happened in SMA C and SMA D in Palopo City.

Based on Tables 4 and 5, the solutions to overcome biology learning difficulties above are closely related to the types of difficulties experienced by the students themselves as follows: Students have difficulty in memorising biological material, the amount of material and terms in biological material that must be understood and memorised so that it requires teachers to make learning biology interesting, such as finding a formula or an easy way for students to understand and memorise biological material; Students have difficulty learning biology, one of which is because the biology material is too much and dense, so it is hoped that the government and teachers will pay attention to the content of the curriculum again; It is necessary for teachers to design practicum-based learning (experiments, observations, and laboratory studies) because students experience learning difficulties, one of which is due to the lack of practicum that can help students understand the material provided by the teacher; Learners realise that the importance of readiness and good study habits so that learners are able to understand and comprehend biology material so that they must include the category of having readiness and disciplined study habits as one way to overcome biology learning difficulties; One of the learning difficulties experienced by students is that the teacher does not connect the material taught with everyday life, making students uninterested in the explanation of the material given by the teacher in class. Teachers should connect the material taught with the daily lives of students so that students are interested and more easily understand and understand the material;

The importance of the availability of facilities in learning so that schools should provide facilities, especially providing learning facilities such as LCDs, practicum tools and others; Teachers become the central

point in learning, the ability and skills of teachers are expected to be able to increase the potential of their students, so that one way to overcome learning difficulties experienced by students is to improve the teaching ability of teachers and classroom management skills, especially regarding teachers must be more creative so that students more easily understand the material; The importance for the government and related agencies to make regulatory policies in the school environment must be in favour of the interests and basic needs of students such as rules prohibiting students from bringing mobile phones (HP) to school so that they return to allowing students to bring mobile phones (HP), this is because students have difficulty accessing information about subject matter at school without using mobile phones (HP) or gadgets.

Conclusion

The results of the study showed that the top 5 difficult biology topics for senior high school students in Palopo City were heredity, coordination system, circulatory system, genetic substance, mitosis and meiosis. While the biology topics that were difficult for students based on the perceptions of biology teachers of State Senior High Schools in Palopo City were metabolism. The types of biology learning difficulties experienced by students include various factors including student characteristics, teaching methods, and environmental limitations. From the various obstacles in learning biology experienced by students, solutions are needed to overcome them. Ways to overcome difficulties in learning biology according to students include suggested solutions involve improving teaching strategies, adjusting the curriculum, and increasing school support.

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The authors declare no conflict of interest.

References

- Abdillah, T. (2022). *Pengembangan e-modul materi metabolisme dan substansi genetik berbasis pendekatan kontekstual terintegrasi nilai Islam pada madrasah*

- alياهو menggunakan linktree [Skripsi: Semarang: Universitas Islam Negeri Walisongo Journal of Physics Education]. Retrieved from <https://eprints.walisongo.ac.id/id/eprint/18159/>
- Adrianto, H., Firmanto, I. A., & Bravimasta, B. D. (2024). Tantangan guru biologi sekolah menengah atas pada topik kardiovaskular: studi di Sidoarjo. *Social, Humanities, and Educational Studies (SHES): Conference Series*, 7(2). <https://doi.org/10.20961/shes.v7i2.86922>
- Adrianto, H., Tandean, V. S., Panggabean, R. T. M., Santoso, N. B., & Ali, M. (2023). Pendampingan Dan Pendalaman Konsep Substansi Genetika Di Biologi Club Sman 1 Tarik. *Sebatik*, 27(1), 265–272. <https://doi.org/10.46984/sebatik.v27i1.2279>
- Anjani, F. (2022). *Pengembangan E-Modul pada Topik Substansi Genetik untuk Memberdayakan Kemampuan Berpikir Kritis Peserta Didik*. Retrieved from <https://digilib.uns.ac.id/dokumen/detail/91984/>
- Ardiansyah, R., Aloysius, D. C., & Rohman, F. (2016). Analisis kebutuhan pengembangan bahan ajar perubahan materi genetik pada matakuliah genetika di universitas negeri malang. *Prosiding SNPBS (Seminar Nasional Pendidikan Biologi Dan Saintek)*, 749–752. Retrieved from <https://proceedings.ums.ac.id/snpbs/article/view/599>
- Ayundari, S., & Manalu, K. (2024). Pengembangan Media Augmented Reality Terintegrasi Nilai-nilai Islam pada Materi Sistem Saraf untuk Meningkatkan Motivasi dan Hasil Belajar Siswa di SMA Swasta Bandar Setia Ujung. *Bioscientist: Jurnal Ilmiah Biologi*, 12(1), 1057–1073. <https://doi.org/10.33394/bioscientist.v12i1.11808>
- Azizah, N., & Alberida, H. (2021). Seperti Apa Permasalahan Pembelajaran Biologi pada Siswa SMA? *Journal for Lesson and Learning Studies*, 4(3), 388–395. <https://doi.org/10.23887/jlls.v4i3.38073>
- Cimer, A. (2012). What Makes Biology Learning Difficult and Effective: Students' Views. *Journal of Educational Research and Reviews*, 7(3). <https://doi.org/10.5897/ERR11.205>
- Ferry, D., & others. (2024). Analisis kesulitan belajar siswa pada mata pelajaran biologi di SMA. *Biosfer: Jurnal Biologi Dan Pendidikan Biologi*, 9(2), 172–181. <https://doi.org/10.23969/biosfer.v9i2.18613>
- Firdaus, Z., Zubaidah, S., & Munzil, M. (2024). Pengembangan Edugame pada Materi Sistem Saraf untuk Siswa SMA. *Bioscientist: Jurnal Ilmiah Biologi*, 12(1), 1472–1488. <https://doi.org/10.33394/bioscientist.v12i1.11924>
- Hariyadi, S. (2018). Identifikasi dan Revisi Miskonsepsi Materi Substansi Hereditas pada Mahasiswa Peserta Semester Sisipan di Universitas Jember. *Jurnal Penelitian Pendidikan Matematika Dan Sains*, 2(2), 32–36. <https://doi.org/10.26740/jppms.v2n2.p32-36>
- Iryanti, M. W., & Puspitawati, R. P. (2021). Validitas LKPD Berbasis Strategi KWL (Know-Want-Learned) untuk Melatihkan Keterampilan Metakognitif pada Materi Pembelahan Sel Siswa SMA Kelas XII. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 10(2), 229–239. <https://doi.org/10.26740/bioedu.v10n2.p229-239>
- Katili, A. S., Mardin, H., Ahmad, J., Hasan, A. M., Latjompoh, M., & Lamangida, N. S. (2024). The Effect of Utilizing Audio Murottal Al-Qur'an and Classical Music on Biology Learning to Increase Students' Learning Concentration. *Jurnal Penelitian Pendidikan IPA*, 10(7), 3905–3912. <https://doi.org/10.29303/jppipa.v10i7.7689>
- Lakapu, M. D. (2023). Penerapan metode kooperatif model TGT (team games tournament) sebagai upaya meningkatkan hasil belajar biologi materi sistem peredaran darah pada siswa kelas XI SMAN negeri Banat tahun pelajaran 2022/2023. *Journal of Innovation Research and Knowledge*, 2(10), 3809–3822. <https://doi.org/10.53625/jirk.v2i10.5225>
- Lestari, S. (2016). Analisis kemampuan technological pedagogical content knowledge (TPACK) pada guru biologi SMA dalam materi sistem saraf. *Proceeding Biology Education Conference: Biology, Science, Enviromental, and Learning*, 12(1), 557–564. Retrieved from <https://jurnal.uns.ac.id/prosbi/article/view/7006>
- Lidi, M. W., & Daud, M. H. (2019). Penggunaan Media Animasi pada Mata Kuliah Biologi Dasar untuk Meningkatkan Hasil Belajar dan Motivasi Mahasiswa Materi Genetika. *Didaktika Biologi: Jurnal Penelitian Pendidikan Biologi*, 3(1), 1–9. <https://doi.org/10.32502/dikbio.v3i1.1886>
- Maghfiroh, K., & Susantini, E. (2023). Pengembangan e-book berorientasi strategi know-want-learned (KWL) untuk melatih keterampilan metakognitif pada materi genetika peserta didik SMA kelas XII. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 12(3), 595–607. <https://doi.org/10.26740/bioedu.v12n3.p595-607>
- Mardin, H., Abdul, A., & Sado, A. I. (2023). Analysis of Student Learning Difficulties in the Material of Inheritance of Traits. *Jurnal Penelitian Pendidikan IPA*, 9(12), 12018–12031. <https://doi.org/10.29303/jppipa.v9i12.3473>
- Muspikawijaya, M., Iswari, R. S., & Marianti, A. (2017). Analisis kesulitan peserta didik SMA/MA Kabupaten Luwu timur dalam memahami konsep pada materi metabolisme sel. *Journal of Innovative Science Education*, 6(2), 252–263. <https://doi.org/10.15294/jise.v6i2.15439>

- Oyekan, O. (2015). Teachers' perception of correlates of students' language competence and Achievement in Biology. *International Journal of Humanities Social Sciences and Education*, 2(1), 93–99. Retrieved from <https://shorturl.asia/Japuz>
- Ozcan, T., Ozgur, S., Kat, A., & Elgun, S. (2014). Identifying and comparing the degree of difficulties biology subjects by adjusting it is reasons in elementary and secondary education. *Procedia-Social and Behavioral Sciences*, 116, 113–122. <https://doi.org/10.1016/j.sbspro.2014.01.177>
- Pradina, L. E., & Yuliani, Y. (2020). Profil miskonsepsi siswa pada materi pertumbuhan dan perkembangan tumbuhan menggunakan three-tier multiple choice test. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 9(2), 310–318. <https://doi.org/10.26740/bioedu.v9n2.p310-318>
- Sani, Y., Sari, N. F., & Harahap, R. D. (2021). Analisis kesulitan belajar siswa pada materi biologi di kelas XI SMA Muhammadiyah-10 Rantauprapat. *Journal of Education Students*, 2(2). Retrieved from <https://jurnal.ulb.ac.id/index.php/berkala/article/view/1696>
- Sariani, N., Prihantini, M. P., Winarti, P., Indrawati, S., Jumadi, S., & Satria, R. (2021). *Belajar dan pembelajaran*. Jawa Barat: Edu Publisher.
- Simanjuntank, J. (2021). *Setiap anak bisa pintar: Prinsip dan metode pembelajaran terarah bagi anak berkesulitan belajar*. PBMR ANDI.
- Yusuf, F. M., Ahmad, J., Dama, L., Mardin, H., Febriyanti, F., & Inaku, I. (2023). Impact of the Use of Interactive Learning Media Based on Articulation 3 to Improve Student Learning Results on Plant Network Structure and Functional Materials. *Jurnal Penelitian Pendidikan IPA*, 9(9), 7691–7698. <https://doi.org/10.29303/jppipa.v9i9.3360>
- Zahroh, D. A., & Yuliani, Y. (2021). Pengembangan e-LKPD berbasis literasi sains untuk melatih keterampilan berpikir kritis peserta didik pada materi pertumbuhan dan perkembangan. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 10(3), 605–616. <https://doi.org/10.26740/bioedu.v10n3.p605-616>
- Zahwa, A., & Isnawati, I. (2020). Validitas Lembar Kegiatan Peserta Didik (LKPD) Berbasis Discovery Learning Materi Hereditas Manusia untuk Melatihkan Keterampilan Berpikir Kritis. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 9(2), 166–171. <https://doi.org/10.26740/bioedu.v9n2.p166-171>
- Zaim, M., Refnaldi, R., & Rahmiyanti, R. (2019). Students' perceptions on teachers' teaching strategy and their effects towards students' achievement. *International Journal of Research in Counseling and Education*, 4(1), 28. Retrieved from <https://pdfs.semanticscholar.org/24fe/f4d615fab17cf8471ddc8e5551d44f75ffe0.pdf>
- Zubaidah, S. (2019). Memberdayakan keterampilan abad ke-21 melalui pembelajaran berbasis proyek. *Seminar Nasional Nasional Pendidikan Biologi*, 1(2), 1–19. <https://shorturl.asia/NM1Hj>