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STUDENTS' LEARNING DIFFICULTIES IN LEARNING BIOLOGY ON ECOSYSTEM MATERIAL BASED ON THE USE OF LEARNING STRATEGIES

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Abstract. This study aims to identify students' learning difficulties in ecosystem materials based on differences in learning strategies and factors causing learning difficulties, and to describe the efforts made by students and teachers to overcome these learning difficulties. This study was conducted at SMA Negeri 1 Bantul from February to May 2025. The method used in this study was a combination of descriptive, quantitative and qualitative methods. Data collection was carried out through questionnaires, interviews, and documentation. The results of the study showed that students experienced fewer learning difficulties in the Discovery Learning (DL) strategy compared to the Project-based Learning (PjBL) strategy. The factor causing learning difficulties in the Discovery Learning (DL) strategy was low student interest in learning, whereas the cause in the Project-based Learning (PBL) strategy was the numerous community activities in which students participated and the teacher's lack of readiness. The efforts made by students included dividing tasks into groups and utilising additional learning resources, while teachers played a role in providing scaffolding and extending the project's duration. These findings suggest that the selection of learning strategies should consider the characteristics and readiness of students to learn.
Keywords: Discovery learning, Ecosystem, Project-based learning, Student learning difficulties

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INTRODUCTION

Learning is the process of acquiring knowledge and experience aimed at changing persistent behaviour and reactions. These changes occur due to a person's interaction with the environment, which is relatively constant and not due to maturation or something temporary (Festiawan, 2020; K. S. Harahap, 2021). Each student has distinct learning tendencies, resulting in variations in behaviour during learning activities. Students who are unable to learn as they should are referred to as having learning difficulties (Nurfadhillah et al., 2022).

Learning difficulties are conditions in which a student's competency or achievement does not meet established standard criteria due to obstacles, distractions, or threats (Parnawi, 2020; Rofiqi & Rosyid, 2020). Low learning outcomes characterise student learning difficulties, resulting in disproportionate effort expended and slowness in completing learning tasks, requiring greater effort to overcome (Ismail, 2016; Munthe et al., 2023). A combination of internal and environmental factors often causes students' learning difficulties.

Factors influencing learning difficulties include internal and external factors. Internal factors refer to conditions or characteristics originating from within the student, such as interest, talent, motivation, enthusiasm for learning, and intelligence (Meutia, 2022; Sudrajat et al., 2023). External factors, on the other hand, originate from outside the student. These factors encompass all environmental aspects, grouped into three categories: family, school, and community (Akmal & Fitriani, 2024). When these factors are not addressed, students struggle to understand the learning material, which impacts their academic achievement.

Students' learning difficulties create a disparity between their intelligence and the academic standards they need to achieve (Akmal & Fitriani, 2024). Research by Kuroru & Rahmah (2023) found that students experience cognitive difficulties, particularly in

ecosystems, in the form of attention deficits, difficulty concentrating, a lack of independent learning habits, and difficulty controlling movement during learning, resulting in a less conducive and comfortable classroom environment. These difficulties are evident in the students' daily test results, with 52% achieving average learning outcomes and 14% achieving very low learning outcomes. Not all students can overcome learning difficulties on their own, so teachers' active role is needed to help address these issues (Laia, 2024).

As educators, teachers not only play a role in the learning process but also in addressing student learning difficulties. Teachers are portrayed as having a dual role known as EMASLIMDEF (educator, manager, administrator, supervisor, leader, innovator, dynamicator, evaluator, and facilitator). EMASLIMDEF tends to be the role of the principal, but on a micro scale in the classroom, this role must also be embraced by teachers in all areas (Musanna & Basiran, 2023). The implementation of all these roles requires support from teachers in implementing effective strategies. Therefore, teachers, as those responsible for learning, must prepare appropriate learning approaches and methods to address these issues.

Strategies implemented by teachers to address student learning difficulties include the application of various learning methods, group tutoring, individual tutoring, and remedial activities (Nusroh & Ahsani, 2019). According to research by Sani et al. (2019), teachers require appropriate approaches and strategies in teaching and learning activities. Therefore, teachers must seek out more information about appropriate methods, approaches, and strategies and try to implement them. The selection of appropriate learning methods is based on the student's actual situation and available infrastructure.

Biology is a subject with complex concepts and problems because it encompasses both abstract and detailed concepts (Mursyidin et al., 2024). At the high school level, the scope of biology material relates to living things themselves, the interactions between living things and their environment, the processes that occur within living organisms, and innovations in biological technology (Nisak, 2021). The complexity of biology material is one of the reasons students experience difficulties in teaching it (Etobro & Fabinu, 2017). According to Simorangkir & Napitupulu (2020), students experience difficulties in learning biology due to the nature of the science itself, its teaching methods, the levels of biological organisation, and the many abstract concepts.

One biology topic often considered difficult is ecosystems. Ecosystems are a biological topic that explores the interactions between living things and their environment. Based on research by L.J. Harahap et al. (2020), the results of a pretest on ecosystems conducted in 10th-grade students at Al Hasra Senior High School showed that students' mastery of ecosystem concepts was still low. This result was supported by a biology teacher's statement, which explained that some students experienced difficulties during class because ecosystem concepts were abstract and complex, as well as their interconnectedness with other biological concepts. Furthermore, students lacked confidence in asking questions of their teachers and in utilising conventional learning models. Several other studies also indicated that students' mastery of ecosystem concepts and achievement fell below the minimum completion criteria (Kurniasih & Listiawati, 2018; Susilawati et al., 2016). These research findings were reinforced by interviews with biology teachers and 10th-grade students at SMA Negeri 1 Bantul.

An interview with a tenth-grade biology teacher at SMA Negeri 1 Bantul in February 2025 revealed that the discovery learning model was used in teaching ecosystems. Meanwhile, an interview with another tenth-grade biology teacher at SMA Negeri 1 Bantul indicated that the ecosystems lesson used a project-based learning model. The differences in the two teachers' teaching strategies resulted in students experiencing different learning experiences. These differences in experience often led to students experiencing obstacles and difficulties during the learning process. Interviews with several tenth-grade students at SMA Negeri 1 Bantul in February 2025 revealed that students experienced learning difficulties related to ecosystems

due to a lack of teaching materials provided by the teacher, which required them to find alternative materials on their own. Another student reported difficulty concentrating and frequently leaving class, requiring them to catch up on missed material at the end of the lesson.

Based on this background, the author is interested in conducting a study entitled "Students' Learning Difficulties in Biology Ecosystems Based on the Use of Learning Strategies." The analysis conducted in this study aims to identify students' learning difficulties in ecosystems based on differences in learning strategies, to identify factors that cause these learning difficulties, and to describe the efforts made by students and teachers to overcome them. This research is expected to serve as evaluation material in developing appropriate learning strategies in ecosystems learning to minimise learning difficulties experienced by students.

METHOD

This research was conducted at SMA Negeri 1 Bantul from February to May 2025. This research employed a descriptive approach, combining quantitative and qualitative methods. The study population consisted of all 323 students in grade X of SMA Negeri 1 Bantul during the 2024/2025 academic year, divided into nine classes. The sample was collected using purposive sampling, comprising 251 students from seven classes: X.A, X.B, X.C, X.F, X.G, X.H, and X.I, as well as two biology teachers who employed different learning strategies. Data collection techniques included questionnaires, interviews, and documentation. The research instruments used were questionnaires, interview guidelines, and documentation sheets.

This study was designed to identify students' learning difficulties, the factors contributing to them, and efforts to overcome these difficulties through questionnaires. The indicators of student learning difficulties used in this study included low learning outcomes, a mismatch between cognitive learning outcomes and effort, slow completion of daily tasks, abnormal behaviour, inappropriate attitudes, and unusual emotional symptoms. The learning difficulty factors used in this study consisted of internal (physiological and psychological) and external (family, school, and community) factors.

The quantitative data obtained were then confirmed through interviews and documentation. Quantitative data analysis was calculated using the following average formula.

$$Average = \frac{Total\ score\ for\ each\ item}{Number\ of\ respondents}$$

After calculating the quantitative data, the category of student learning difficulties and the causal factors are then determined using the appropriate criteria in Table 1.

Table 1. Criteria for Learning Difficulty Identification Scores and Factors Causing Learning Difficulties

Score Range	Category
1,00 – 1,79	Very Low
1,80 – 2,59	Low
2,60 – 3,39	Moderate
3,40 – 4,19	High
4,20 – 5,00	Very high

The qualitative data obtained will be analysed using the stages outlined by Miles et al. (2014), namely data collection, data condensation, data presentation, and conclusion.

RESULTS AND DISCUSSION

Results

Identification of Learning Difficulties in Ecosystem Material Between Discovery Learning and Project-based Learning Strategies

Based on the analysis of learning difficulties among class X students of SMA Negeri 1 Bantul, using ecosystem material, and referring to differences in learning strategies, specifically the Discovery Learning (DL) and Project-based Learning (PjBL) strategies, a comparison of difficulty levels is presented in Table 2.

Table 2. Comparison of the Results of the Questionnaire on Identification of Learning Difficulties for Ecosystem Material in Discovery Learning and Project-based Learning Strategies

No.	Indicators	*Discovery Learning*		*Project-based Learning*	
		Average	Criteria	Average	Criteria
1.	Low learning outcomes	2.89	Moderate	3,26	Moderate
2.	Cognitive learning outcomes mismatch with effort	2.74	Moderate	3,07	Moderate
3.	Slow completion of daily tasks	2.57	Low	2,78	Moderate
4.	Abnormal behavior	2.15	Low	2,19	Low
5.	Inappropriate attitudes	2.82	Moderate	2,75	Moderate
6.	Inappropriate emotional symptoms	2.54	Low	2,62	Moderate
	Average	2,62	Moderate	2.78	Moderate

Based on Table 2, there were differences in learning difficulties in the ecosystem material between the implementation of the two learning strategies in grade 10 of SMA Negeri 1 Bantul across two indicators: first, the indicator of slow completion of daily assignments. The discovery learning class had an average score of 2.57, a low score, while the project-based learning class had an average score of 2.78, a medium score. These results indicate that the discovery learning class falls within the low score, meaning that most students complete assignments on time. The following interview results support this.

Student S8 stated that he was "*always on time*."

Teacher S added that "*almost all students can be on time for both individual and group assignments.*"

Meanwhile, in the project-based learning class, the average score for the slow completion of daily assignments fell within the medium score, meaning that most students were late in completing assignments assigned by the teacher. The following interview results support this.

Student S203 revealed:
"*I was once late in submitting a worksheet because I failed a lab and had to retake it. So, the project assignment was to be observed at home, and it was left at the home of one of the students closest to the school, but he wasn't very helpful in observing*."

Teacher A explained:
"*For the terrarium report assignment, there was a group that was late in submitting the worksheet because it failed initially and was asked to redo it. Yesterday, they said a friend missed the scheduled observation and the living creature died, so they asked for permission to retake it*."

Second, regarding indicators of inappropriate emotional symptoms, the discovery learning class had an average score of 2.54, which is a low criterion. In contrast, the project-based learning class had an average score of 2.62, which is a medium criterion. According to these results, the discovery learning class falls into the low criterion, as evidenced by the following interview.

Student S8 said, "*I feel sad when I can't understand the material*."

Although the results indicate a low criterion, it cannot be denied that some students still struggle with biology, as evidenced by displaying inappropriate emotional symptoms, such as persistent sadness and frustration, due to a lack of understanding of the ecosystem material.

Student S92 expressed this, saying, "*If I can't understand, I feel sad, really annoyed because I feel like I don't understand and can't do it anymore*."

Meanwhile, in the project-based learning class, the average score for the indicator of inappropriate emotional symptoms was classified as moderate. Some students expressed frustration during the lesson. Student S203 expressed this:

"*The ant farm assignment was just as bad. I don't want to repeat it as the terrarium one; it's just a hassle. I'm tired of doing it, and some of my friends aren't very helpful. I don't want to work with them anymore*."

Thus, it can be concluded that students in the PjBL class experienced significantly more difficulties learning ecosystem material compared to students in the DL class.

Factors Causing Difficulties in Learning Ecosystem Material Between Discovery Learning and Project-based Learning Strategies

In addition to comparing the learning difficulties of grade X students of SMA Negeri 1 Bantul in ecosystems material between the two learning strategies, the results of a comparison of the factors causing their learning difficulties were also obtained. These results are presented in Table 3.

Table 3. Comparison of Questionnaire Results of Factors Causing Difficulties in Learning Ecosystem Material in Discovery Learning and Project-based Learning Strategies

Indicator	*Discovery Learning*		*Project-based Learning*	
	Average	Criteria	Average	Criteria
Internal factor				
Physiological Factors	2.05	Low	2.19	Low
Psychological Factors	2.52	Low	2.65	Moderate
Overall Average	2.29	Low	2.42	Low
External factor				
Family Factors	2.39	Low	Low	Low
School Factors	2.63	Moderate	2.76	Moderate
Community Factors	2.72	Moderate	2.79	Moderate
Overall Average	2.58	Low	2.71	Moderate

Based on the results in Table 3, it is evident that students' learning difficulties in studying ecosystems in grade 10 of SMA Negeri 1 Bantul are influenced by both internal and external factors, with varying patterns of influence across different learning strategies. In general, external factors have a greater influence on students' learning difficulties in Project-Based Learning (PBL) classes, with community factors (2.79) and school factors (2.76) being

the dominant factors. According to interviews with students in the PjBL class, the intensity of community activities in which students participate can contribute to learning difficulties. The following student revealed this:

> *"I participate in many organisational activities at school, and I also participate in youth groups at home, which often have events. Yesterday, when I was working on a project at my friend's house, I was a bit confused about how to allocate the time and activities because there was an event in the village at the same time. It was quite distracting for me."*

In addition to these factors, school factors also contributed to students' learning difficulties in the PjBL class. According to interviews with students in the PjBL class, the teaching methods used by teachers were insufficient to help students understand the material on ecosystems in project-based learning. The following interview results reinforce this.

> Student S147 said:
> *"I was once asked to create a terrarium and an ant farm project, but the report only covered the terrarium, not the ants, and the teacher didn't follow up."*
>
> Student S203 added:
> *"When creating the terrarium and ant farm, the challenges were more due to uncooperative group members and the teacher. The teacher didn't provide any guidance on the worksheet or examples of what to write about. They only provided it in the worksheet, and even then, it wasn't written clearly, and the class only explained it once."*
>
> Teacher S explained:
> *"In an ecosystems lesson, I once asked them to create a closed terrarium as a project. The ant farm project was only for three classes, and one didn't have time to complete it. Indeed, the report was only for the terrarium project; the ant farm project was just a distraction, with no specific material or report. I didn't specifically create the students' worksheets; I mostly guided the students' activities through Google Classroom."*

Meanwhile, in the Discovery Learning (DL) class, internal factors, specifically psychological factors (2.52), require special attention. Although the psychological factor score in the DL class is lower than in the PjBL class, Discovery Learning relies heavily on students' mental readiness. According to student interviews, not all students are interested in the subject of biology. The following interview reinforces this.

> Student S8 stated:
> *"I don't really like biology. During the environmental observation lab, I wasn't enthusiastic because I was confused about where to start observing, and I didn't have a clear idea of what to observe."*
>
> Teacher S confirmed:
> *"Some students don't seem to like biology, as can be seen from their responses during the lesson. Once, I asked students to observe ecosystem components, but what they observed was different. Yesterday, they were asked to observe ecosystem components*

in the soil, and they said they only observed soil, even though other students saw ants, crickets, and worms."

Therefore, it can be concluded that external factors, particularly community and school factors, are the primary factors contributing to students' learning difficulties in the Project-Based Learning strategy. Meanwhile, in the Discovery Learning strategy, internal factors — particularly psychological factors —require special attention because they directly influence the effectiveness of the learning strategy. This difference indicates that when selecting a learning strategy, it is necessary to consider the student's condition and their environment to minimise obstacles to the learning process.

Efforts Made to Overcome Learning Difficulties in Ecosystem Material for Class X of SMA Negeri 1 Bantul in the 2024/2025 Academic Year

The efforts made by students and teachers to address the learning difficulties of 10th-grade students at SMA Negeri 1 Bantul in ecosystems are certainly diverse. Each student and teacher has their own unique approach to overcoming the difficulties they experience. These various efforts were identified through interviews.

Efforts at Discovery Learning Learning Strategies

Based on interviews with tenth-grade students using the discovery learning strategy, the students' efforts to overcome learning difficulties in ecosystems included asking the teacher, discussing with friends, studying independently at home by reviewing the material, seeking learning resources on the internet, and always sitting in the front row. These efforts are demonstrated in the following interview results.

Student S8 stated, *"When in class, I try to ask the teacher and discuss with friends. At home, I often study with my circle of friends and review the material myself."*

Student S84 revealed, *"I once discussed difficult material with the teacher after the class was finished, and I always sat in the front so I could hear clearly because I had difficulty hearing."*

Student S92 added, "*At home, I prefer to study alone by reviewing the material and searching online."*

Meanwhile, the teachers' efforts to overcome students' learning difficulties in ecosystems included teaching using a combination of strategies, re-explaining difficult material, reconfirming with students, providing special accommodations for students with disabilities, and offering examples of learning activities. These efforts are demonstrated in the following interview results.

"I have a good understanding of children's learning styles... I try to teach using a combination of methods to avoid focusing solely on one learning style. Currently, I've been re-explaining and re-confirming material to students who find it difficult, specifically. Meanwhile, for students with hearing impairments, I provide special treatment. ... I also try to provide examples before letting children go to do observation activities. As much as possible, children have an idea of what they will be doing. Then, in the future, I will change my approach, add student worksheets, and sharpen assignments, especially on material that is considered difficult."

Efforts at Project-based Learning Learning Strategies

Based on interviews with 10th grade students using project-based learning strategies, the efforts that students have made to overcome learning difficulties in ecosystem material are discussing with friends, asking biology teachers, asking OSN guidance tutors, searching for additional materials from the internet, studying independently at home by summarising materials from various sources, looking at friends' notes, and making a schedule of tasks in working on projects. These efforts are shown in the following interview results.

> Student S147 said:
> "*We often ask classmates and people from other classes, as well as the OSN guidance counselor and teachers. We also search for additional materials on Google. Regarding the obstacles in completing the project yesterday, my friends and I had already arranged a schedule for each person. However, we haven't been able to implement it consistently, so we need to be more responsible in the future*."

> Student S203 stated:
> "*If I don't understand the material, I often discuss it with friends, study via WhatsApp, and meet up. I rarely discuss it with the teacher. At home, I study more independently, enrich the material by researching it myself, summarising it from various sources, and drawing my own conclusions. Regarding the obstacles in my project assignment yesterday, I overcame them by reprimanding my uncooperative friends and changing the storage location for my project*."

> Student S212 added:
> "*In class, I've discussed things with my friends and teachers if I really don't understand, and I've looked at my friends' more detailed notes. But outside of school, I often ask questions to friends who already understand through chats, group work, and studying the material online*."

Meanwhile, efforts made by teachers to overcome students' learning difficulties in the classroom include presenting learning material through various strategies, providing a variety of learning resources, being available to students for questions, explaining difficult concepts, offering concrete examples for each topic, and extending the student's time to complete assignments. These efforts are demonstrated in the following interview results.

> *"As a teacher, I don't really understand students' learning styles, but I try to convey and present the learning in various forms, starting from lectures, discussions, analysis, and compiling projects. ... The efforts I have made are by trying to provide references, either links to learning materials or ebooks, I am also willing to be contacted if students need and want to ask via message, and I have explained the material that is considered difficult ... and provided various examples of problems ... Meanwhile, for the problem of students not being able to complete assignments on time, I usually give them time flexibility, but the grades will be slightly different. Starting from on time, slightly late, and very late submission, the grades obtained will definitely be different and not optimal."*

Discussion

Student Learning Difficulties Based on Learning Strategies

The results of the study indicate that tenth-grade students' learning difficulties in ecosystems differ based on the learning strategies used. In general, students in Project-based Learning (PjBL) classes exhibited higher levels of learning difficulties compared to students

in Discovery Learning (DL) classes. Significant differences were seen in indicators of slow completion of daily assignments and inappropriate emotional symptoms.

For the slow completion of daily assignments, the average score in the Discovery Learning class was 2.57 (low criteria), while in the Project-based Learning class it was 2.78 (moderate criteria). These results indicate that students in PjBL classes tended to be slower in completing daily assignments than students in DL classes. According to Simatupang et al. (2024), PjBL requires proper time management because this learning process produces a tangible product, thus requiring a considerable amount of time.

In addition to time management, PjBL also requires collaborative skills among individuals or students (Azizah, 2022). If these two aspects are not optimally implemented, it can result in delays in completing assignments. This finding aligns with research by Rohman et al. (2024), which suggests that group leaders who fail to distribute tasks evenly among their members according to their abilities can create imbalances among group members in project learning. This imbalance was evident in the lack of student engagement in group discussions and the limited participation of students in assignments. This condition resulted in projects requiring a longer time to complete.

Meanwhile, in Discovery Learning strategies, students experienced fewer difficulties compared to Project-Based Learning (PjBL) strategies. Although Discovery Learning is considered a discovery-based learning strategy, in terms of inquiry levels, it is classified as the lowest level of inquiry (Wenning & Khan, 2011). This condition arises because, in Discovery Learning, the majority of learning activities remain teacher-centred, thereby limiting students' exploration (Asyhari & Clara, 2017). Limited exploration means that the majority of the learning structure is provided by the teacher, thus reducing students' opportunities to formulate problems and design investigations (Colburn, 2000). This limitation impacts students' learning difficulties because all instructions for completing tasks in Discovery Learning are systematically and clearly structured. This result is reflected in the findings of this study, which showed students' ability to complete assignments on time. These results indicate that students experienced fewer learning difficulties than those using the Project-Based Learning (PjBL) model. According to Joyce & Weil (2015) in their book "Models of Teaching," the discovery learning model is less challenging for high school students because it is more suitable for lower grades who are still in the early stages of developing abstract thinking, rather than for students capable of critical and complex thinking. This inaccuracy arises because high school students already possess a prior understanding, necessitating inquiry activities or further investigation to achieve an optimal understanding.

The second apparent difference between the two strategies is the indicator of unusual emotional symptoms. Students in the Project-Based Learning class scored an average of 2.62 (moderate criteria), while the Discovery Learning class scored 2.54 (low criteria). These results indicate that students in the Project-Based Learning class tend to experience slightly higher levels of emotional distress than those in the DL class. This statement is likely due to the influence of group dynamics. According to the results of this study, it was found that students experienced conflict with their teammates due to a lack of cooperation, which led to emotional outbursts among their teammates. Bell (2010) revealed that students who have a dominant role in project-based learning often experience emotional exhaustion due to taking on greater responsibilities.

In contrast, in the Discovery Learning class, although students were also known to experience difficulties learning ecosystems, the level of emotional distress they displayed tended to be lower than in the PjBL strategy. This result is because the learning burden in this strategy is individualised and does not depend on other students. However, the low emotional symptoms scores of students in the DL class do not mean that no students experience emotional difficulties at all. One student admitted that he often felt disappointed and annoyed with himself

when he was unable to understand concepts independently. This condition presents a challenge in implementing this strategy because the Discovery Learning strategy is considered to pay insufficient attention to the development of students' concepts, skills, and emotions as a whole (Ardelina et al., 2021). The emotional state experienced by these students aligns with research by Fithriyah et al. (2021), which explains that students who are unable to learn independently will have more difficulty controlling their emotional turmoil. In contrast, students who engage in independent learning are more able to manage their emotions.

Factors Causing Student Learning Difficulties Based on Learning Strategies

The analysis of factors contributing to the learning difficulties experienced by 10th-grade students in the ecosystems topic reveals a significant difference between the two learning strategies. In the Project-Based Learning class, external factors, particularly community factors (2.79) and school factors (2.76), were more dominant than other factors. This result suggests that the external environment has a significant impact on students' learning difficulties in project-based learning.

Community factors were identified as the primary factor contributing to students' learning difficulties in project-based learning. Findings revealed that students' participation in community activities hindered their learning process in the Project-Based Learning (PjBL) learning strategy. Students who are actively involved in many activities in their surroundings could potentially hinder their involvement in project-based learning. Busy social activities lead to students lacking time management skills (Chasanah et al., 2025). This issue presents a serious challenge because the success of Project-Based Learning (PBL) is highly dependent on students' ability to manage time, develop collaborative schedules, and meet project deadlines (Syaidah & Afrizal, 2023). The time required to complete a project in Project-Based Learning (PjBL) is longer than in conventional learning (M. Harahap et al., 2024). Although this learning process takes longer, the allotted time for project completion is limited. Furthermore, the numerous social activities students participate in can impact their ability to manage their time effectively within the allotted time limits.

In addition to the community environment, school-related environmental factors also contribute to the learning difficulties experienced by students. Environmental factors, particularly inadequate teacher preparation, contribute to student learning difficulties, particularly in project-based learning. Astuti et al. (2025) noted that another significant challenge in implementing this strategy is the teacher's readiness and competence in designing and managing projects. Astuti explained that inadequate administrative support will negatively impact student learning in Project-Based Learning (PjBL). In this context, teacher readiness for PjBL implementation appears to be lacking, as evidenced by the lack of available teaching modules for this learning approach. It is the responsibility of educators to develop comprehensive and systematic teaching modules for effective learning (Salsabilla et al., 2023). A learning process that fails to plan teaching modules effectively can result in unsystematic content delivery to students, leading to an imbalance between teacher and student involvement (Maulida, 2022). This learning strategy, however, requires a balance between the two, involving both teachers and students actively (Negraha & Tuara, 2024).

Meanwhile, in Discovery Learning, internal factors, particularly psychological factors, are a key determinant of learning difficulties, although psychological factors are considered relatively low (2.52). The dominant finding regarding this factor is that students have a low interest in learning. Interest in learning is a psychological aspect of a person's learning, demonstrated through enthusiasm, participation, and active involvement in the learning process (van Aswegen & Pendergast, 2023). The DL strategy emphasises the value of student independence and initiative in the process of actively discovering concepts, so low interest in learning can trigger learning difficulties in students with this strategy.

Furthermore, low learning interest also results in a lack of student enthusiasm during DL learning. This low enthusiasm makes it difficult for students to discover concepts or information on their own, as they tend to be passive during the learning process. Meanwhile, the principle of the DL strategy itself emphasises the concept discovery process. This result indicates that learning will occur through a process of independently discovering concepts, which students will learn, thereby producing durable knowledge that is not easily lost (Ardelina et al., 2021). If someone is passive in DL learning, the discovery process will be ineffective due to the student's inability to independently discover concepts. This condition will result in a low level of student conceptual understanding.

Efforts to Overcome Learning Difficulties Based on Learning Strategies

In the Discovery Learning (DL) strategy, some students still struggle to discover concepts on their own. This obstacle requires effort to overcome, preventing it from becoming persistent and maintaining learning effectiveness. Steps students take to overcome these difficulties include discussing the material with teachers or peers, rereading it, and seeking additional learning resources online. These efforts align with the principles of the Discovery Learning strategy, which emphasises student independence. These efforts demonstrate self-regulated learning, enabling students to continue to develop their knowledge independently (Wanda Widiya & Ahmad Syarqawi, 2023).

Teachers implementing the Discovery Learning strategy have demonstrated that efforts to address students' learning difficulties include providing scaffolding in the form of examples of learning activities. Scaffolding is a form of support provided to students who are experiencing difficulties. This assistance is provided in the early stages of learning and is gradually reduced as the students' needs decrease (Kusmaryono, 2021). This result aligns with the opinion of Antisna & Sayono (2025), who stated that the application of scaffolding within the Zone of Proximal Development (ZPD) is considered capable of addressing educational issues such as students' lack of interest in the material, low active engagement in learning, and difficulty understanding abstract and complex concepts such as biology. Implementing these efforts can support students according to their developmental needs and bridge the gap between their actual abilities and their maximum potential.

Meanwhile, in the Project-Based Learning strategy, the learning difficulties experienced by students in studying ecosystem material predominantly stem from a lack of group dynamics and an inability to manage time effectively. Students attempt to overcome these difficulties by scheduling group activities that take into account the roles of each member. This effort is considered quite effective for fostering team collaboration, but requires a genuine commitment to its effective implementation. Wulandari et al. (2019) emphasised that group work on a project requires students to carefully allocate the workload to each team member evenly and allocate the required time. With these efforts, project activities will no longer experience a lack of allocated time, and no member will be overloaded with tasks. Teachers implementing Project-Based Learning strategies have attempted to address student difficulties by extending the duration of the project. This additional time is typically provided as an accommodation for students with learning difficulties (Supriyani et al., 2022). However, a unique finding from these teachers' efforts is the difference in grades awarded to students who complete assignments on time and those who complete them later. According to Nuraeni & Syihabuddin (2020), this is one of the teachers' strategies for addressing learning difficulties through punishment. This strategy is justified, but it must be accompanied by consideration that punishment should motivate students, not injure or cause depression.

Recommendations for Effective Learning Strategies

Each learning strategy implemented in ecosystem learning has its own strengths and

challenges. The Project-Based Learning strategy is considered effective in fostering active student engagement and collaboration. However, this strategy faces challenges in terms of time management and high emotional stress on students. These difficulties stem from the numerous activities students participate in within the community, which disrupt and limit project time, creating pressure to collaborate. Furthermore, teachers' lack of preparedness in developing learning administration, such as teaching modules, also contributes to the difficulties in PJBL learning.

Meanwhile, the Discovery Learning strategy is considered effective in enhancing student independence and initiative. However, in its implementation, students experience similar learning difficulties as the PjBL strategy, but with lower scores. These difficulties arise from students' inability to discover concepts independently, particularly among students with low learning interests.

Based on these findings, the recommended learning strategies for ecosystem learning are as follows: 1) The Discovery Learning strategy is recommended for the initial stages of ecosystem learning, particularly in developing basic understanding and honing students' scientific thinking skills. However, it should be noted that teachers need to provide scaffolding at the beginning of learning for students who have low learning interest so that they can still follow the learning well; 2) Project-based Learning strategy is recommended for advanced stages, especially in linking ecosystem concepts with real phenomena through projects. However, it should be noted that teachers need to prepare learning tools in the form of project activity teaching modules before learning and increase the duration of project work.

CONCLUSION

Based on the overall research data, it can be concluded that the learning difficulties experienced by students in the Discovery Learning (DL) strategy are fewer compared to those in the Project-based Learning (PjBL) strategy. Student learning difficulties in the Discovery Learning (DL) strategy are often attributed to low student interest in learning. Meanwhile, factors contributing to student learning difficulties in the Project-based Learning (PjBL) strategy include a lack of time management due to the numerous activities students participate in within the community environment, as well as a lack of teacher readiness in designing and implementing project-based learning. Efforts made by students to overcome learning difficulties in the Discovery Learning (DL) strategy include discussing with teachers or friends, rereading lesson materials, and searching for additional learning resources on the internet. In contrast, efforts provided by teachers take the form of scaffolding assistance. Meanwhile, efforts made by students to overcome learning difficulties in the Project-based Learning (PjBL) strategy involve arranging group activity schedules according to the roles of each member, while efforts provided by teachers are in the form of additional project work duration. The findings of this study suggest that the selection of learning strategies should consider the characteristics and learning readiness of students. This condition is because there are differences in the tendency to experience learning difficulties with each application of learning strategies.

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