JURNAL EDUKASI BIOLOGI
Volume 12 No 1, March 2026, 10-20
ISSN: 2986-5484 E-ISSN: 2986-4828
DOI: 10.21831/edubio.v12i1.25235

Analysis of learning difficulties of students in regular and sports-specific classes (SSC) on cell material

Nailatul Arafah[1], Ahmad Kamal Sudrajat[1*]
[1]Department of Biology Education, Universitas Negeri Yogyakarta, Indonesia
*E-mail: kamalsudrajat@uny.ac.id (corresponding author)

Abstract. This study aims to identify and describe the forms and levels of students' learning difficulties in cell material at SMA Negeri 2 Playen, analyze the causal factors, and determine the efforts students make to overcome them. This descriptive study uses a quantitative approach reinforced by qualitative data. The subjects of the study were 11th-grade biology students and 11th-grade biology teachers. Data were collected through questionnaires, interviews, and document analysis, using instruments that had been tested for content and construct validity and for Cronbach's Alpha reliability. Quantitative data were analyzed using descriptive statistics, while qualitative data were analyzed using the Miles & Huberman model. The results showed that learning difficulties included understanding, remembering, focusing, differentiating, and drawing, with an SSC student's internal factors difficulty level of 2.41 (high category). The causes differed between regular and SSC classes. Student efforts included searching for additional materials, re-understanding, summarizing, memorizing, asking others for help, and seeking tutoring. Teachers are advised to try other methods, such as the Team Game Tournament (TGT). This study provides teachers with insights to address student learning difficulties in both regular and sports classes.
Keywords: Cell material, Learning difficulties, Regular classes, Special sports classes

Received: 13 August 2025 Revised: 02 March 2026 Accepted: 04 March 2026 Published: 30 March 2026

INTRODUCTION

The development of science and technology has a significant impact on biology education (Mukhlish & Paidi, 2025). The curriculum and learning are now directed at mastering 21st-century skills, namely communication, collaboration, critical thinking, problem-solving, as well as creativity and innovation (Sinaga, 2023). This is in line with the research of Anugrah et al. (2025), which states that rapid global changes require the education system to continue adapting, not only in curriculum but also in classroom learning approaches. According to Nerita et al. (2022), The differences in the way each individual processes information can be observed from each individual's learning style, so teachers need to pay attention and know these differences to be able to make and determine effective strategies in learning.

Biology in high school has the characteristics of complex, abstract, and rich material in scientific terms, so it is a challenge for teachers and students (Fahira & Puspitawati, 2025). According to Cahyono (2019), Learning difficulties arise from obstacles during the learning process, causing students to have difficulty achieving optimal learning outcomes. Based on the results of the 2024–2025 school year learning evaluation at SMA Negeri 2 Playen, the average value of cell material was at a score of 65.3, below the Minimum Completeness Criteria (KKM) 80 (Sumiati, 2025). The cell material taught for the first time in class XI has a wide scope, is microscopic, and is difficult to visualize without media.

Learning difficulties in cell material include difficulties with understanding scientific terms, misconceptions, low self-confidence, boredom, and academic stress. External factors such as limitations in visual media, variations in learning methods, and environmental support also influence (Maisyarah et al., 2024). This condition is increasingly complex with the merger

of regular class students and special sports classes (SSC) into a single biology specialization class, which may lead to differences in academic characteristics. SSC classes have unique characteristics because the students are more interested in physical (motor) activities. This sometimes causes their academic side to receive less attention.

This research aims to identify and describe students' learning difficulties, analyze internal and external factors that affect them, and uncover students' efforts to overcome these barriers. Theoretically, this study is expected to enrich research on the difficulties of learning biology through complex and abstract materials. Practically, the results can serve as a reference for schools in designing innovative learning programs, helping teachers develop appropriate learning strategies, providing students with insights into improving their learning strategies, and serving as a reference for future researchers in developing media or biology learning approaches.

METHODS

Research design

This type of research is descriptive research using quantitative data reinforced by qualitative data. This descriptive research aims to identify and describe the form and level of student learning difficulties in cell materials at SMA Negeri 2 Playen, analyze the causal factors, and identify the efforts students make to overcome them. According to Sugiyono (2017), Descriptive research describes a situation or event by collecting data, allowing researchers to understand ongoing events. This research was conducted at SMA Negeri 2 Playen, located in Plumbon Kidul, Logandeng, Playen, Gunungkidul. Data collection will be carried out in May 2025.

Research subject

The population in this study comprises grade XI biology students at SMA Negeri 2 Playen, totaling 214 students (186 regular classes and 28 special sports classes). This research was conducted at SMA Negeri 2 Playen, located in Plumbon Kidul, Logandeng, Playen, Gunungkidul. Data collection was carried out in May 2025. error 5% (0.05) and a confidence level of 95% to determine the number of samples, resulting in 140 students (122 regular classes and 18 special sports classes). In addition, there are 2 biology teachers who teach in grade XI and serve as additional informants to strengthen findings on students' learning difficulties due to internal and external factors, as well as on the learning strategies implemented.

Research Instrument and data collection

This research instrument includes a questionnaire on learning experiences and perceptions of the material, as well as guidelines for teacher and student interviews. This study uses three data collection techniques to examine students' learning difficulties in cell materials. First, the distribution of closed- and open-ended questionnaires to students to explore cognitive and affective perceptions, psychological conditions, the role of teachers, learning strategies, the availability of infrastructure, and the influence of the family environment on learning difficulties. Second, semi-structured interviews with teachers and students to obtain more in-depth supporting information about the causes of learning difficulties, both from internal and external factors, as well as efforts made to overcome them. This interview covers the same aspects as the questionnaire. Third, document analysis in the form of learning outcome scores, class data, and teaching modules to relate empirical data with indications of student learning difficulties.

The questionnaire is aimed at grade XI students (regular and special sports) who are taking biology specializations. Two questionnaires are given to students: the student learning experience questionnaire and the student perception questionnaire on cell material. The student

learning experience questionnaire consists of positive and negative statements. The questionnaire uses a four-point Likert scale, namely Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). At the same time, the open questionnaire uses a description form. The interviews were conducted with students from regular and special sports classes who received the highest, middle, and lowest scores, as well as biology teachers who taught in class XI.

Instrument Validity and Reliability

This research instrument has been tested for validity and reliability. The instrument's content validity ranges from 0.843 to 0.855, indicating a very valid category according to the expert. Meanwhile, the validity of the construct with a total of 34 statements on the questionnaire instrument in the form of a likert scale has an *r> value of a table of* calculation in the range of 0.175 – 0.817 and *r of a table* with a significance level of 0.05 has a value of 0.165, so that the instrument is valid because it already has a *rr value of the table.* Furthermore, the instrument's Cronbach's alpha ranges from 0.739 to 0.853, indicating reliability, with values > 0.70 considered reliable. The instrument is feasible and can be used for research data collection because it meets the criteria for validity and reliability.

Data Analysis Techniques

Quantitative Data Analysis

Quantitative data were obtained from the questionnaire results as average scores and analyzed using descriptive statistics. The likert scale questionnaire used is a scale of four so that positive statements in the Strongly Agree (SA) category have the highest weight or score (4) and the Strongly Disagree (SD) category has the lowest weight or score (1), on the other hand, negative statements in the Strongly Agree (SA) category are given the lowest weight or score (1) and the Strongly Disagree (SD) category has the highest weight or score (4) (Erinsyah et al., 2024).

According to Sugiyono (2017), Descriptive statistical analysis is a method used to process and present data as it is, without the intention of drawing general or comprehensive conclusions. Data analysis used descriptive statistics to calculate the average Likert-scale score for the 4-questionnaire. The score interval is determined by the 0.75 interval formula, resulting in categories: 1.00–1.75 (Very Low), 1.76–2.50 (Low), 2.51–3.25 (High), and 3.26–4.00 (Very High). Interpretation of learning difficulties with an inversely proportional average score. The higher the average score, the lower the student's learning difficulty. On the other hand, the lower the average score, the higher the level of student learning difficulty (Nusaibah & Murdiyani, 2017).

Qualitative Data Analysis

Qualitative data analysis in this study uses the model of Miles and Huberman in Sugiyono (2018) which includes the stages of data collection, data reduction, data presentation, and the conclusion drawn. Data were collected through semi-structured interviews with grade XI Biology teachers and students with learning difficulties to explore learning constraints in cell material, teaching methods, and teachers' efforts to help students. The results of the interviews were then reduced by sorting information according to the research focus, such as the factors causing the difficulty, the teacher's perception of student understanding, and learning strategies. The reduced data is presented as a narrative and a categorization table of findings, and initial conclusions are drawn based on the patterns and themes identified. To ensure the validity of the data, verification is carried out through triangulation of sources by comparing information from teachers and students.

RESULTS AND DISCUSSION

Results of Analysis of Student Learning Difficulties Questionnaire on Cell Materials

There are two types of questionnaires: student learning experience questionnaires to identify internal and external factors that contribute to students' difficulty learning in cell materials, and student perception questionnaires on cell materials to identify the forms of student learning difficulties and students' efforts to overcome them. Filling out the questionnaire by grade XI students majoring in biology at SMA Negeri 2 Playen, which is as many as 140 students (122 students in the regular class and 18 students in the special sports class (SSC))

Closed Questionnaire

The four-scale closed questionnaire was reviewed from the aspects of internal and external factors. The results of the questionnaire indicate that students in special sports classes (SSC) experience high learning difficulty due to internal factors, as shown in Table 1.

Table 1. Factors of students' learning difficulties in cell materials at SMA Negeri 2 Playen

Factor	Participant Groups			
	Regular class	Learning Difficulty Category	Sports Class (SSC)	Learning Difficulty Category
Internal	2.60	Low	2.41	High
External	2.91	Low	2.75	Low

Indicators in the context of internal factors include cognitive and affective factors, perception of the material, and psychological conditions. The average learning difficulty score across the three indicators is shown in Table 2.

Table 2. Factors of student learning difficulties in internal aspects

Internal Factor	Participant Groups			
	Regular class	Learning Difficulty Category	Sports Class (SSC)	Learning Difficulty Category
Cognitive and affective	2.69	Low	2.66	Low
Perception of material	2.44	High	2.15	High
Psychological conditions	2.63	Low	2.33	High

Based on Table 13, it is known that regular class students have great difficulty in the indicator of perception of material, with an average of 2.44, and students in special classes in sports have high learning difficulties in the indicators of perception of material and psychological conditions, with an average of 2.15 and 2.33, respectively. The results of the calculation of learning difficulty scores for each cognitive sub-indicator are shown in Table 3.

Table 3. Average score of learning difficulties per cognitive and affective sub-indicators

Sub-indicator	Participant Groups			
	Regular class	Learning Difficulty Category	Sports Class (SSC)	Learning Difficulty Category
Interest in learning	2.80	Low	2.65	Low
Motivation to learn	2.18	High	2.55	Low
Readiness to learn	2.66	Low	2.75	Low

Based on Table 3, regular classes also show learning difficulties in the high category of the learning motivation subindicators, with an average of 2.18. The results of the calculation of learning difficulty scores for each sub-indicator of perception of the material are shown in Table 4.

Table 4. Average score of learning difficulties per sub-indicator of perception of the material

Sub-indicators	Participant Groups			
	Regular class	Learning Difficulty Category	Sports Class (SSC)	Learning Difficulty Category
Basic concepts of cell material	2.54	Low	2.22	High
Structure and organelles	2.49	High	2.17	High
Membrane transport	2.26	High	2.05	High
Cell metabolism	2.40	High	2.05	High
Cell division	2.45	High	2.22	High

In this indicator, the sub-indicator is a sub-chapter of the cell material. Sub-indicators of the basic concept of cell matter include cell function, structure, and cell type. Based on Table 4, the regular origin class has difficulty learning in the higher-level sub-chapters on cell structure and organelles, membrane transport, cell metabolism, and cell division. Meanwhile, students in the special sports class have a high level of learning difficulties across all sub-chapters, namely the basic concepts of cell matter, structures and organelles, membrane transport, cell metabolism, and cell division. The results of the calculation of learning difficulty scores for each sub-indicator of psychological condition are shown in Table 5.

Table 5. Average score of learning difficulties per sub-indicator of perception of the material

Sub-Indicators	Participant Groups			
	Regular class	Learning Difficulty Category	Sports Class (SSC)	Learning Difficulty Category
Lack of Self-Confidence	2.60	Low	2.33	High
Burnout	2.75	Low	2.55	Low
Academic Stress	2.54	Low	2.11	High

Based on Table 5, students in the special sports class (SSC) experienced high learning difficulties in the sub-indicators of low self-confidence and academic stress, with average scores of 2.33 and 2.11, respectively. Meanwhile, students in the special sports class (SSC) achieved high scores on the external aspect of difficulties, namely the family environment indicator and the family support sub-indicator, with an average of 2.50.

Based on interviews with students and teachers, students in the special sports class had activities such as after-school practice, which sometimes ran into the evening. Cells were taught at the beginning of the semester as the first biology topic taught to 11th-grade students. In addition to students in the special sports class, several students from the regular class also participated in many extracurricular activities at the beginning of the semester, such as competitions and school delegations, including the flag-raising team (Pakibra). This resulted in many students feeling exhausted, which influenced the internal factors in this study.

"*Their training is erratic; some of them stay up until 10 o'clock at night, 11 o'clock, so that their sleep time is disturbed, so at the time of cell learning they do not focus on following the learning"* (Informant with the initials L, as a biology teacher)

In addition, students who do not participate in full learning are required to take notes on the material as a substitute task. For SSC students, catching up with the material is common, so disciplined learning habits have been formed in special sports classes, as students in this class have committed to focusing not only on academic but also on non-academic learning. In this case, students in special sports classes have already developed positive learning habits, such as training to create study schedules and set daily learning targets, which serves as an effective way to build discipline and maintain consistency in learning (Segara et al., 2025). Meanwhile, regular students still have difficulty managing time to study independently, so

many records are left behind, making regular class students even more incomprehensible because they are already behind. This causes regular students to lack motivation to learn and interest in learning. Learning interest is closely related to learning motivation because when students like the lesson, they are more enthusiastic about participating in the learning process (Segara et al., 2025).

According to Nuryani (2024), students' motivation to learn can decrease due to a lack of parental support, an unconducive learning environment, academic pressure, low self-confidence, lack of life goals, and negative peer influences. A less conducive environment and peers influence regular students at SMA Negeri 2 Playen, while SSC students face a heavy curriculum burden, lack of confidence, academic stress, and lack of parental support (Sadiyah et al., 2024; Segara et al., 2025). However, the motivation of SSC students remains high thanks to discipline and peer support (Puspitasari et al., 2025; Nuryani et al., 2024). Teachers have not adjusted learning methods for two different student backgrounds, plus the impact of online learning, which makes initial understanding uneven (Afiani & Faradita, 2021). In addition, the absence of teaching modules is an external obstacle that makes learning less directed, increases cognitive load, and exacerbates difficulties in understanding cell material, especially for SSC students.

Open Questionnaire

The open-ended questionnaire revealed the difficulties of cell material related to cognitive factors, perception, participation, the role of teachers, the learning environment, and the involvement of others, as well as students' efforts to overcome them.

1) Cell Submatter Difficulty

Students in the regular origin class and the special sports class (SSC) experienced the most difficulty with the submaterial on cell function structure. Still, students in the special sports class also had the most difficulties with all cell materials, as shown in Figure 1.

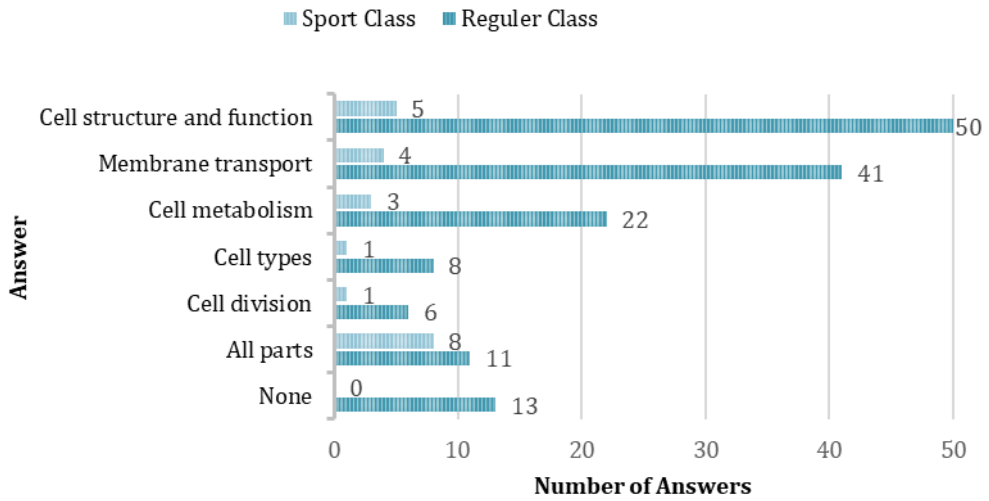

Figure 1. The difficulties on cell material

2) Forms of learning difficulties

The most common form of learning difficulty experienced by regular and special sports classes is difficulty in understanding, as shown in Figure 2.

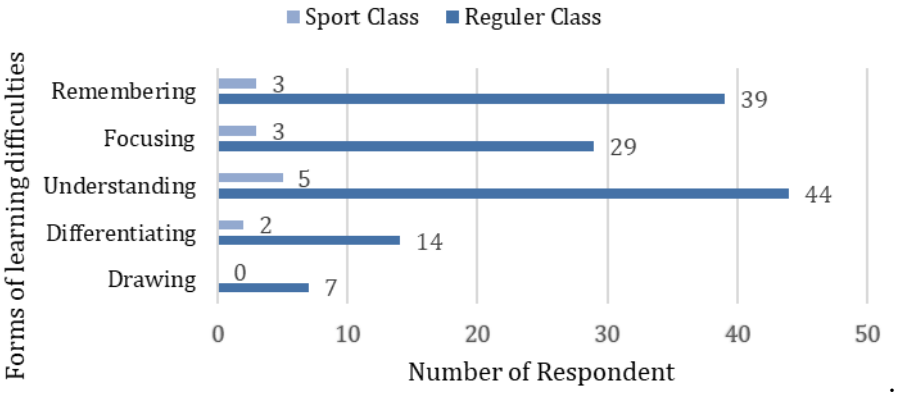

Figure 1. Forms of learning difficulties

3) Causes of difficulties in perception factors towards the material

Students in regular and special sports classes (SSC) have the most difficulty with the perception that the material coverage is too much, can be seen in Figure 3.

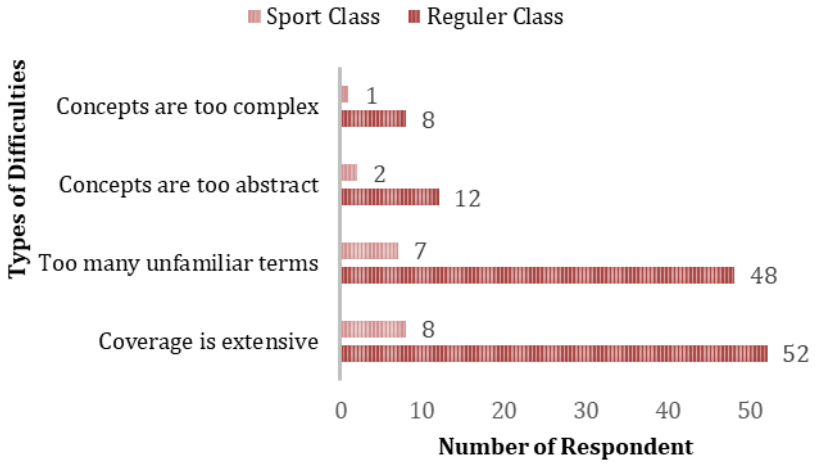

Figure 2. Perception of cell material coverage

3) Students' efforts to overcome learning difficulties

The effort of students in the regular class to face learning difficulties is to find additional materials. The material can be actual and video-based, tailored to the needs and learning style of each student. Meanwhile, students in special sports classes have the most reading and re-understanding. The students' efforts are evident in Figure 4.

Hidayati & Budijastuti (2024), found that in membrane transport materials, 15% of students held misconceptions, and 8% did not understand the concepts, assuming the material was complicated due to difficult terms and the interconnectedness of concepts such as diffusion. The teacher also assessed cell metabolism and membrane transport as the most difficult concepts. Dhani & Brata (2022), added that cell metabolism is difficult to understand because it is abstract and requires learning media. In line with Muspikawijaya et al. (2017) that state students have difficulty understanding scientific terms, chemical reactions, and relationships between concepts. In this study, the main forms of difficulty for regular and SSC students were understanding (C2), followed by remembering (C1), focus (psychological), distinguishing (C4), and drawing (C6/C3) (Astuti, 2021). These difficulties are related to limited concentration, anxiety, and low self-confidence. Rahmah & Purwoko (2024) and Sadiyah et al. (2024) as well as the use of complex scientific language. Some students also get confused about cell definitions, parts, and functions, and have difficulty visualizing cell structures.

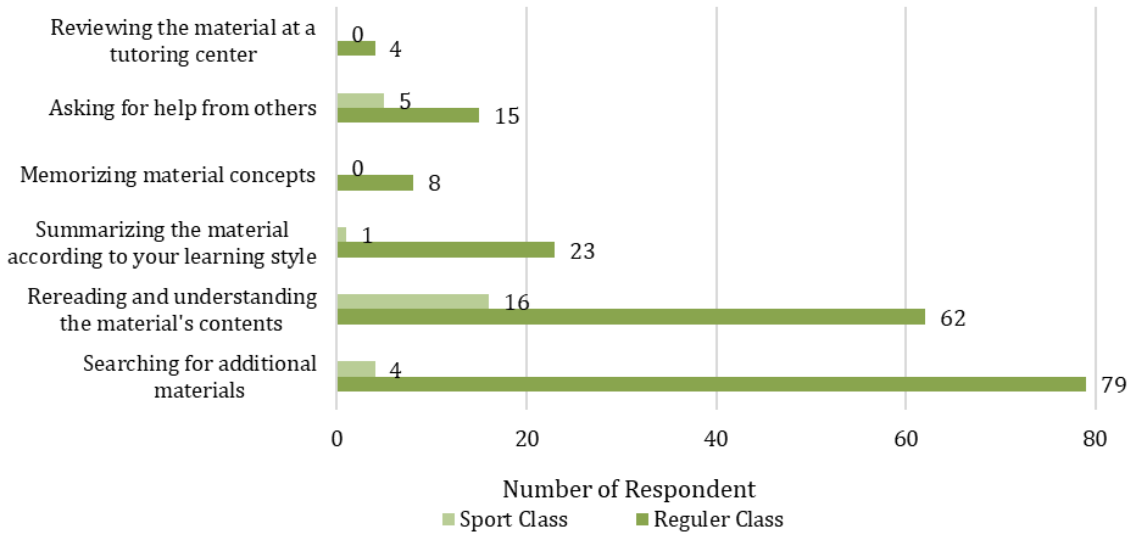

Figure 3. Students' efforts in overcoming learning difficulties

Based on the results of the analysis, students made six main efforts to overcome learning difficulties, namely searching for material on the internet, reading/re-understanding, summarizing, memorizing, asking for help from others, and following (Apriani & Sudrajat, 2025). Searching for materials on the internet is the most common strategy, in line with the implementation of the Independent Curriculum, which gives freedom to choose learning resources (Pradana & Fetriani, 2025). The Internet is considered effective in improving learning outcomes (Risniyani & Soeprijanto, 2025), but guidance is needed to make sources credible and avoid misconceptions (Djarwo et al., 2025; Misriana, 2024). Some students use YouTube according to visual and auditory learning styles, which support autonomy, competence, and social connectedness (Syifaa et al., 2025), although it has the potential to be distracting.

Other strategies include rereading during exams (Asiah et al., 2025), memorizing concepts for auditory students (Rais et al., 2020) and creating summaries or keywords for students with read/write learning styles. Learning preferences also vary, from learning with music to a calm atmosphere (Nurjanah et al., 2025). Some ask for the help of teachers, friends, or family as a form of peer support, although the majority prefer to study independently (Howard-Jones et al., 2024). To support both groups of students, teachers can apply the *Team Game Tournament* (TGT) method, which has been proven to increase motivation, confidence, and learning outcomes (Zuschaiya, 2025).

CONCLUSION

This research is motivated by the low level of understanding among SMA Negeri 2 Playen students of abstract and complex cell matter, especially in the sub-materials of cell structure and function, membrane transport, and cell metabolism. The findings showed that students' learning difficulties include understanding (C2), remembering (C1), focusing, distinguishing (C4), and drawing (C6), with the main causative factors coming from negative perceptions of the material, psychological conditions (lack of confidence and academic stress), low learning motivation, lack of parental support, and the absence of learning modules. Students overcome difficulties in various ways, such as finding learning resources on the internet/YouTube, rereading, summarizing, memorizing, maintaining a learning atmosphere, and asking for help from others, even though these approaches are not fully effective. As an innovation, learning can be directed through cooperative strategies such as the Team Game Tournament (TGT), which emphasizes active engagement, builds confidence, and strengthens understanding of concepts. Further research is expected to develop technology-based visual-

interactive media and methods to facilitate learning about cell material, as well as to explore differentiation approaches that account for the characteristics and needs of students from diverse classroom backgrounds.

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