

An Examination of the Learning Difficulties Faced by Students in Biology at the Secondary Level in the District of Mardan

Dr Rukhsana Durrani

Assistant Professor, Department of ECE & ETE Allama Iqbal Open University,
rukhsana.durrani@aiou.edu.pk

Mohammad Rafiuddin

Elementary and Secondary Education Department, Khyber Pakhtunkhwa
rafiuddinsocialengineer@gmail.com

Dr Muneer Ahmed

Assistant Professor, University of Education, Attock Campus, muneer.malik2022@gmail.com

Abstract

This research attempted to explore the numerous internal and external variables that contribute towards learning challenges in Biology amongst secondary school students in District Mardan Khyber Pakhtunkhwa. The research used a quantitative methodology including a descriptive-correlational framework. Three hundred ninety children from grade 9 and 10 were recruited using cluster sampling methods from public schools. The data was gathered with a Likert-scale questionnaire with a Cronbach's Alpha value of 0.846, which is considered to be a good reliability. The results from descriptive statistics and Pearson correlation proof that external factors, such as lack of resources (Mean = 3.47), conventional teaching methods (Mean = 3.24) and lack of parental involvement (Mean = 3.13), had the most massive influence on learning difficulties. Among the internal variables, prior knowledge was the most important with a mean score of 3.18. The Pearson correlation analysis showed strong correlations between learning challenges in terms of available resources ($r = 0.838, p = 0.000$), home environment ($r = 0.806, p = 0.000$) and cognitive capacity ($r = 0.763, p = 0.000$). The outcomes were the rejection of both null hypotheses. The results show that difficulties in Biology are complex and are influenced significantly by interactions between, on the one hand, the educational and on the other hand, the domestic settings. Recommendations include enhancement of parental involvement, increased educational resources, pedagogical strategy and modification of assessments in order to encourage cognitive development.

Keywords: Learning Difficulties, Biology, Internal Factors, External Factors, Secondary Level

Introduction

The basic idea of learning should be to improve the development of the potential of students in several fields, such as intellectual, emotional, physical, and others, and also to promote intellectual, emotional, spiritual, and skill intelligence under the new paradigm. Specifically, in the sphere of scientific education, the goal is to fully develop the cognitive, emotional, and physical abilities of students within the classroom setting (Marchuk et al., 2024). Babalwa & Newlin (2023) put forward that learning involves people attempting to change their behaviour and acquire information, skills, attitudes and good values from the things they interact with. The education process of teaching and learning may sometimes be harsh. In the field of education, however, one major obstacle can be a problem faced by learners who experience learning difficulties, which can negatively affect their academic achievement. In addition, learning is a dynamic process that arises out of a person's effort to adapt and develop through his/her interaction with the environment, experience new things, and improve his/her understanding through interaction (Tawfik et al., 2022). Learning in an educational setting emerged as a result of the interaction of students, educators and physical resources.

Moreover, the learning approach has been formulated in order to improve the internal cognitive processes of the pupils, which are determined by both the intrinsic and extrinsic elements. (Fatah et al., 2024).

Obstacles in evaluating, understanding or effectively using ideas are indicative of learning difficulties. Daily and learning problems could impede students' achievement of their educational targets and academic accomplishment. The learning process is hampered by particular hurdles emanating from educational problems, of which the students are unaware most of the time. Such obstacles can be caused by some factors, such as societal influences, psychological circumstances, and physiological constraints, that affect the overall learning process (Simbolon et al., 2022). Sociological elements represent the features of the social environment that may affect learning and educational outcomes. Sociological elements are social structures, organisations, relationships, and cultural norms that influence the individual's experiences during educational settings, and psychological elements of mental and emotional processes that affect learning. The elements include attitudes, beliefs, motives, emotions, self-esteem, anxiety and cognitive abilities such as memory, attention and critical thinking skills. Physiological problems such as brain diseases, sensory limitations, chronic diseases, weariness, dietary deficiencies or physiological limitations affect human learning ability. This study had not examined physiological aspects.

Furthermore, Biology is the systematic study of the natural world through observation and investigation, the development of theories and rules to understand the basic principles underpinning the various events. Furthermore, research is necessary in helping to solve the world's problems in famine, climate change, environmental degradation, energy scarcity and public health emergencies. Biology is the basis for sustainable solutions to complex problems through research-based and research-informed policies to ensure the security of current and future generations (National Academies of Sciences, Engineering, & Medicine, 2017). Scientific procedures are employed to build observations, generate hypotheses, experiment and analyse data. Biology aims to discover the facts of the cosmos to increase the understanding of man. A community that has progressed in the field of Biology and technology often achieves more success than one that has not (Faize & Dahir, 2011).

In Pakistan, Biology education begins in elementary school and is combined with other courses. In grades 6 through 8, it is taught as a general science subject. During the 9th and 10th grades, the teaching of Biology became distinct fields of study. Students in artistic disciplines are required to do a broader scientific program. Students in grades 9 and 10 take external exams that are conducted by the secondary school boards. Upon completion of grade 10, Biology students frequently want to get admission to a university or a higher secondary school. Some private schools offer the Cambridge or London University O and A-level curriculum (Rauf et al., 2021).

Students in 9th and 10th grades experienced educational problems in Biology subjects because of various circumstances. The dearth of good learning resources and educational facilities in the schools in District Mardan is a significant concern. The unavailability of well-equipped labs, traditional textbooks and inadequate teacher training or workshops are some of the reasons for educational obstacles. Furthermore, socioeconomic inequalities play an important role in the participation of students in scientific education. Students who come from disadvantaged backgrounds have limited access to educational resources and opportunities for extra-school advancement (Cinel, 2022).

Objectives of the Study

The following were the objectives of the study:

1. To assess the internal variables influencing learning difficulties in Biology at the secondary level in District Mardan.
2. To assess the external variables influencing learning difficulties in Biology at the secondary level in District Mardan.
3. To investigate the substantial correlation between internal characteristics and students' learning difficulties in Biology.
4. To investigate the substantial correlation between external influences and students' academic difficulties in Biology.

Research Questions

1. What internal variables contribute to learning difficulties in Biology at the secondary level in District Mardan?
2. What external variables impede learning in Biology at the secondary level in District Mardan?
3. What is the correlation between internal factors and students' learning difficulties in Biology?
4. What is the correlation between external variables and pupils' difficulties in studying Biology?

Research Hypotheses

H01: There is no significant relationship between internal factors and students' learning difficulties in Biology at the secondary level.

H₀2: There is no significant relationship between external factors and students' learning difficulties in Biology at the secondary level.

Literature Review

Learning difficulties

Learning issues are about the difficulties that pupils experience in understanding teachings. These difficulties hamper the learning of students, possibly leading to failure or lower performance in realising their educational goals. The researcher puts forward that problems in the study of scientific disciplines are formed as a result of a confluence of internal and external elements. Internal elements are psychological characteristics such as interest, motivation, and health; while external elements are the educational environment, pedagogical approaches, accessible resources, and familial support (Gui & Akuba, 2023). Learning problems can impact a learner intellectually, as well as personally, and as such, it is a multifaceted issue. Unlike learning difficulties, which are often linked to neurological issues, learning obstacles can be caused by other factors, such as environmental, social, and psychological factors (Antonis, 2022). Winarti (2021) claims that learners encountered obstacles in the process of education that prevented the achievement of their learning objectives, and this phenomenon is known as learning difficulties.

The issues that the students of secondary schools in Mardan, especially concerning their writing skills in English, have been found to largely affect performance in the subjects such as Biology. Writing difficulties like coherence, critical thinking, fluency problem makes it difficult to perform in academic assignments well. Addressing these issues via school resources, tutoring and workshops on writing could help students improve their overall academic success, including in Biology (Rafiuddin et al., 2024).

Barriers such as cultural norms, safety concerns and poor facilities have been identified as major difficulties for rural girls in Mardan to access education. These difficulties often impact on their ability to participate fully in areas such as Biology. Cultural norms like early marriage and gender-specific expectations prevent many girls from pursuing education beyond the primary levels while lack of proper facilities and transportation continue to prevent them from educational development. These barriers account for the difficulties in academic performance in subjects such as Biology (Rafiuddin et al., 2023).

Identifying these obstacles is vital to appreciate and state the difficulties that pupils face and to identify the reasons for these. This helps educators to identify answers and reduce the chances of similar learning problems in the future.

Furthermore, suboptimal learning outcomes of students are attributed to several variables, such as internal and external ones (Afrianis et al., 2022). Mazza (2017) has claimed that external effects contribute to the learning problems in scientific disciplines more than the innate talents of the individuals. Factors like familial environment, financial level, and lack of motivation play a significant role in the moulding of the learning experience of the students. Students from low-income households may experience disadvantages because of a lack of access to educational resources, and a lack of parental support may result in a lack of motivation and participation in scientific disciplines.

Internal Factors of Learning Difficulties

Internal variables that affect obstacles to learning in Biology could be attitude, previous knowledge and cognitive capacity.

Attitude

The positive attitude towards Biology is greatly enhanced by motivation and involvement, while the negative attitude leads to reduced interest in the biology subject. Research shows that academic success and motivation in scientific disciplines are based on students' good attitudes towards Biology. The correlation between motivation and attitude towards the biology subject is exactly proportional (Dere, 2024). Students' perceptions about Biology are strongly shaped by their feelings of competence, referring to the self-assessed proficiency in Biology. When students perceive their required skills as limited to being good in Biology, a negative attitude develops, and students become less interested and engaged. This weakened confidence could set a path for a lack of self-belief, resulting in a lack of effort, poor execution, and disinterest in research in the scientific sciences (Phil Canlas, 2024).

Previous Knowledge

Enhanced learning happens when the information from the past is available; pupils make links between what they are learning and what they already know. As learners use their previous knowledge, they make predictions and construct ideas about new topics, and thus increase their interest and motivation (Belouiza et al., 2024). Nevertheless, previous knowledge mostly makes the learning of new ideas easier, while some studies show that it may obstruct the assimilation of new information, as irrelevant past knowledge may inhibit learning (Brod, 2021).

Cognitive Ability

A great deal of research has proven that this cognitive ability plays a significant role in learning difficulties. This research is conducted to study the relation between cognitive talents and student performance in Biology, so reduced cognitive ability may prevent students from understanding the complex scientific topics (Widyasari & Hermanto, 2022). Cognitive abilities have a substantial impact on scientific literacy, which depends on cognitive capabilities. While the development of sophisticated cognitive abilities is positively related to lessening learning problems, studies show that these learners may still face difficulties in areas such as biology. The research showed that even pupils with higher cognitive skills tend to rely on intuitive forms of thinking, making erroneous judgments on scientific issues (Gousopoulos, 2023).

External Factors of Learning Difficulties

External influences, especially those linked to familial and educational contexts, play an important role in learning difficulties in the branch of biology—external variables that affect learning difficulties in Biology (Rusli et al., 2023).

Family Factor

Improved engagement in learning, which is encouraged through positive relationships between parents and children within the family environment, develops positive learning habits and provides necessary support (Chen et al., 2023). Furthermore, research has demonstrated that family stress is a contributing factor to an increase in depression among students, which not only negatively affects their performance in school but also their learning ability (Deng, Y., 2022). Familial issues that could potentially hinder the successful study include parental neglect of children's education as well as a chaotic and/or disruptive environment (Yessa et al., 2022).

Parental Involvement

The parental involvement creates a good learning environment, which is a must for students with learning difficulties (Ybañez et al., 2024). The involvement of parents in learning activities related to Biology, such as group inquiry-based assignments, improved both the scientific inquiry skills and overall academic performance of pupils (Dignam, 2023). The National Science Teachers Association states that parental involvement makes a significant difference in improving children's achievement regardless of socioeconomic level or racial origin (NSTA).

Home Environment

The pupils' excitement and proficiency in Biology supplements the availability of science-related activities and resources at home (Ker et al., 2023). Introducing biology-related activities at home throughout childhood is very crucial for the growth and acquisition of scientific information in any child in the future. Research results show that youngsters who are involved with activities such as experiments or instructional Biology games or talks on nature at home create a stronger understanding of scientific ideas (Bae et al., 2023).

Available Resources

Workshops and sessions are implemented for the enhancement of Biology education, yet their lack of presence may affect both the ability of education and students to keep updated with the latest developments in Biology and pedagogical techniques. The lack of assistants may result in conventional teaching methods that may eventually lead to learning difficulties for pupils (Zhou et al., 2023). The lack of essential facilities, like labs or ill-equipped facilities, hinders practical experimentation, which leads to students having trouble understanding the scientific ideas and, as a result, poor performance in academics. Novianti et al. (2022).

Teaching Methods

Educators employ ineffective pedagogical methods, such as unclear explanations, traditional teacher-centred teaching methods, dated teaching tactics, and conceptual errors, which could create issues with engagement and impede the learning process (Azahra & Wahyudi, 2024). Interaction between the learners and instructors is very important in the educational process. The importance of this connection may impact the efficacy of student learning. The active involvement of educators may enable a smoother learning environment. On the other hand, less contact and greater physical distance between students and instructors may lead to less engagement in the learning process. Research has shown that positive teacher-student relationships improve the academic participation and general interest of kids. Research suggests that strong relationships between teacher and student offer a significant amount of social support, therefore improving levels of engagement among students (Liu, 2024).

Classroom Environment

Utilisation of Internet of Things (IoT) technology may be used to improve the environment of a classroom by monitoring the situation and providing data that can be utilised for improvement (Tan et al., 2024). Nonetheless, the success of tutoring using both practical and theoretical courses is dependent on the availability of materials and

resources. The lack of availability or the absence of resources in the curriculum impacts the ability of the instructors to deal with the pupils in the classrooms, according to the educators (Almeida et al., 2023). Educational tools like interactive whiteboards, digital quizzes and online discussion forums make it easier for students to collaborate with each other and share ideas. Such classrooms offer space for collaborative learning and feedback systems (Kang et al, 2023).

Peers' Interaction

Students learn from one another through problem-solving, especially in complicated subjects such as quantum physics, where students learn better when they cooperate with peers (Brundage et al., 2022). Research suggests that the use of collaborative learning strategies improved means scores from 68.05 to 77.29, which could suggest that an increased level of student participation is correlated with improved learning results (Widysari et al., 2022). The research depicts that peer interaction learning improves the social and intellectual skills of students. Students gain a better understanding of the material and improve their teamwork and communication skills when they teach others (Tzuriel, 2021).

Research Methodology

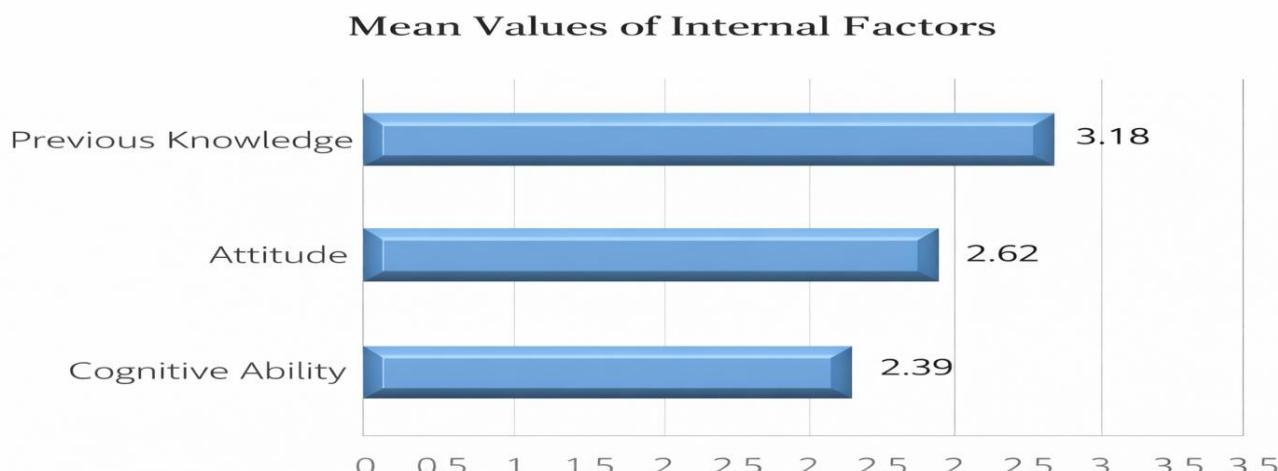
The quantitative method of research was employed. This study tried to find the elements that contribute internally and externally to the learning gap in the topic of Biology. A descriptive correlation design is a research methodology that incorporates some characteristics of both descriptive and correlational research in its attempt to examine correlations between variables in the absence of manipulation. The research population consisted of students of secondary levels, i.e. 9th and 10th grade, from public schools of the Mardan area only. In District Mardan, there were 166 government high schools, 86 for boys and 80 for girls, in which a total number of 119,456 students were enrolled. There were 119,456 secondary-level pupils engaged in District Mardan for the 2023-2025 academic session. This strategy refers to dividing the target population into separate administrative or geographical entities known as "clusters" from which a random sample is drawn for data collection. The main aim of cluster sampling is to make data collection an effective and cost-efficient approach, particularly if the population is geographically spread out or if it is impossible to obtain a complete list of the population. We carried out surveys at secondary schools across a number of Tehsil Mardan, District Mardan. The sample was male and female students in the ninth and tenth grades. Krejcie & Morgan (1970) say that, for a population size of 119,456, the required sample size is approximately 383. I brought seven more respondents into my study to make a total of 390. The instruments of study used in the current research work were the questionnaire as the means of data collection. Cronbach's Alpha was used using the software package SPSS to determine the reliability of the surveys. Cronbach's Alpha was found to be 0.846. The data were analysed using descriptive-inferential statistics, and Pearson's correlation was used to test the hypotheses.

Result

SPSS was used to analyse the data collected, as well as to calculate the frequencies, percentages, mean values and standard deviations for each statement. Presented the results in tabular and graphical forms.

Figure I

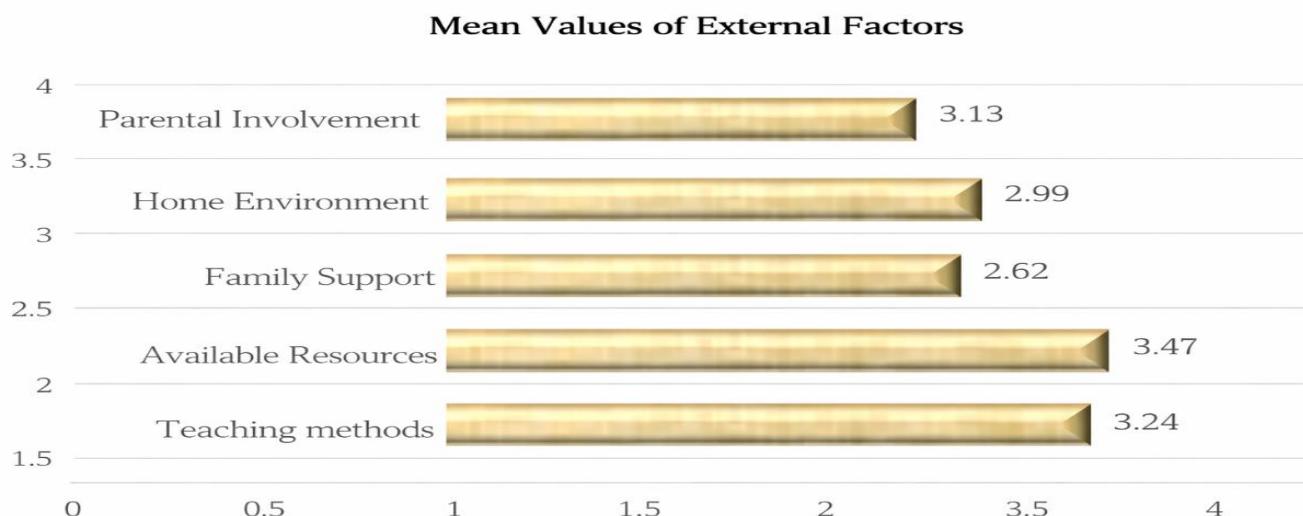
Mean Values of Internal Factors



Graph one shows the mean values of the internal (personal) characteristics discussed to see which variables have the highest level of relations with obstacles of learning in the topic of Biology at the Secondary level of District Mardan. The result shows that the previous knowledge, with a mean value of 3.18, was the most contributing factor.

Figure 2

Mean Values of External Factors



Graph 2 shows that resources available in schools with a mean value of 3.47 had a significant contribution towards learning obstacles in the Biology topic at the secondary level in District Mardan among the factors. The teaching style had a score of 3.24, parental participation ranked 3.13, the home environment ranked 2.99, and the family support ranked 2.62, indicating their contribution to the obstacles in learning in the scientific subject in descending order.

Table 1

Relationship between internal(personal) factors and learning difficulties.

Learning difficulties	Pearson correlation	Learning difficulties	Previous Knowledge	Attitude	Cognitive Ability
		I	0.36	0.314	0.763
	Sig.(2-tailed)		0.00	0.000	0.000

The table shows that the correlation between learning difficulties and previous knowledge is $r = 0.36$ with the significance level of 0.03, which is below 0.05. Also, the correlation between learning difficulties and attitude is $r = 0.314$, which is $p = 0.000$. Furthermore, the correlation between learning difficulties and cognitive ability has the following values: $r = 0.763$, and also the level of $p = 0.000$. Given that $p < 0.05$. Given that $p < 0.05$, this shows that the association is statistically significant. As a result, there exists a considerable linear relationship between learning problems and the past information, attitude and cognitive capacity. **Table 2**

Relationship between external factors (family factors) and learning difficulties.

		Learning difficulties	Parental Involvement	Home Environment	Family Support
Learning difficulties	Pearson Correlation	I	0.73	0.806	0.496
	Sig. (2-tailed)		0.000	0.000	0.000

es that the correlation between learning difficulties and parental involvement is $r = 0.73$ with a significant level of 0.000. In addition, the correlation between learning difficulties and home environment is $r = 0.806$, also with a level of significance of 0.000. Furthermore, the correlation between learning challenge and family support is $r = 0.496$, with a significance level of $p = 0.000$, which is all below 0.05, and hence, they are all statistically significant. Consequently, there is a significant linear correlation between learning obstacles and parental participation, home environment and family support.

Table 3

Relationship between external factors (schools' factors) and learning difficulties.

An Examination of the Learning Difficulties Faced by Students in Biology at the Secondary Level in the District of Mardan

		Learning difficulties	Available Resources	Teaching Methods	Classroom Environment	Peers Interaction
Learning difficulties	Pearson correlation	I	0.838	0.418	0.405	0.359
	Sig. (2-tailed)		0.000	0.000	0.000	0.000

The result, as shown in the table, is that the correlation between learning difficulties and available resources is $r = 0.838$, and the level of significance is $p = 0.000$. In addition, the correlation between learning difficulties and teaching methods is $r = 0.418$, which is also significant at $p = 0.000$. The correlation between learning difficulties and classroom environment found a $r = 0.405$, which has a significance level of $p = 0.000$. Lastly, the correlation between learning difficulties and the interaction with peers is $r = 0.359$, significant at $p = 0.000$. All significance levels are less than 0.05, which means that the relations are statistically significant. Consequently, an important linear correlation is observed between learning problems and resources, pedagogical approaches, atmosphere of the class and peer interactions.

Discussion

This study was conducted to determine the internal and external factors affecting the learning difficulties in students and the correlation between the internal factors and learning difficulties, and external factors and learning difficulties in Biology subjects at the secondary level in District Mardan. The internal determinants were previous knowledge, cognitive ability, and attitudes toward studying scientific topics. The statistics reveal a moderate level of previous knowledge in the students of Mardan, which creates learning issues in the field of Biology. Students with more previous knowledge were able to assimilate new ideas better, and thus have improved their academic performance (Hailikari et al., 2008). Furthermore, results show that pupils in the Mardan area have a good attitude towards the study of Biology. Favourable dispositions towards scientific education have been positively correlated with increased motivation as well as improved learning results (Aldila et al., 2018). External influences are both familial and educational in nature, such as parental engagement, domestic atmosphere, and familial support, as well as resource availability, pedagogical approaches, classroom dynamics, and peer interaction. The results showed that internal and external variables made a significant contribution to learning problems in Biology at secondary levels in District Mardan. The disposition towards studying scientific disciplines and the cognitive capacity were measured by questionnaires, whereas previous knowledge was measured by the past academic performance of students towards Biology topics. External problems like parental involvement, effectiveness of resources and ineffective pedagogical approach at the secondary level in District Mardan lead to learning problems in scientific disciplines. The findings suggest that difficulties that learners experienced in biology were a result of a confluence of internal and external influences. The findings indicate that external influences presented greater learning problems in scientific disciplines as compared to internal factors. In addition, there is a relationship between cognitive capacity and learning difficulties in scientific disciplines. Research suggests that low cognitive capacity can result in a challenge when studying scientific courses, and academic achievement is dependent on cognitive capacity (Shi & Qu, 2022).

The data analysis process showed that there are considerable relationships between familial characteristics and student difficulties in biology. Parental involvement is associated with a significant positive relationship with learning problems in scientific disciplines, meaning that less parental involvement relates to greater learning barriers for pupils in those subjects. The results correlate with research indicating that an increase in parental participation increases student enthusiasm and involvement in Biology education (Fan et al., 2010).

The result of such research is a positive correlation of internal variables that hinder learning in scientific topics. A moderate positive relation between previous knowledge and learning barriers shows that the more experienced learners face more difficulties as they discover new biology concepts and processes. Studies have shown that the impacts of previous knowledge on the performance of the cognitive stress response lead to an improvement in learning performance, whereas the learning difficulties of Biology can be negligible (Dong et al., 2020). A significant relationship has been found between attitudes held towards biology topics and barrier factors to learning, which implies that pupils who experience learning difficulties have a negative attitude towards Biology. Research revealed that having a good attitude towards scientific education improved academic achievement and eased the challenging situation experienced by students in Biology (Mao et al., 2021). Furthermore, results showed a positive relationship between the domestic environment and educational difficulties. This suggests that having inadequate resources at home prevents the pupils from understanding scientific concepts, hence causing problems in studying biology. Moreover, results indicated that

students who have less familial support face greater learning difficulties in biology. The research reflected that a conducive and supportive atmosphere is established when family members help the students with learning difficulties in biology (Sha et al., 2016).

Research shows that external influences, including those associated with the school environment, affect the learning problems of students in biology. Learning problem is significantly associated with accessible resources with respect to school characteristics in Biology. Research shows that schools that are well-resourced are essential for successful teaching and learning (Cinel, 2022). Learning difficulties-Teaching methodologies are linked with learning difficulties in the Biology subject. Research suggested that advanced and interactive teaching strategies, such as experiments, demonstrations, and collaborative activities, will promote student engagement and learning in biology (Darling-Hammond et al., 2019). The atmosphere in the classroom and the way peers interact with each other are linked to the learning difficulties in biology subjects. The research showed that positive peer relationships are associated with improved academic performance and enable cooperation and support for each other among the learners (Wang & Eccles, 2012).

Conclusion

The primary objective of this research was to study the learning problems of the students of secondary level in biology in District Mardan. The main variables of this research were internal factors, such as previous knowledge, cognitive ability and attitude towards Biology, external factors, including familial factors such as parental involvement, home and family support and external factors related to school environment, including resources, pedagogical approaches, classroom atmosphere and interpersonal interactions.

This is concluded from data showing that internal variables and previous knowledge play a significant role in learning obstacles in biology. The attitude towards the study of biology is favorable among the pupils of the secondary level in District Mardan. It also understands the private mental skills of every student that pose a challenge in the subject of biology. Furthermore, it is found that inadequate parental participation, in terms of little contact with the scientific educators and absence at school meetings and activities, reinforces learning difficulties in biology topics. Moreover, the problems with studying biology are due to the lack of socioeconomic limits in the field, a lack of resources and a lack of an allocated area at home. Moreover, the tender of the educational institutions in Mardan District is hampered by insufficient resources, such as poorly equipped laboratories, outdated content of courses, absence of workshops and programs aimed at the improvement of learning biology, and the insufficiency of advanced pedagogical techniques such as experimentation and demonstration, as well as underutilization of modern materials (simulations, online resources). Furthermore, conditions in the classroom and peer relations can contribute to learning difficulties in scientific disciplines.

The results of the present research show that a relationship exists between both internal characteristics and external factors, which are linked with learning obstacles in biology. Findings show that, from internal characteristics, the existence of cognitive capacity has the highest correlation with learning obstacles in scientific disciplines. In addition, familial variables could be correlated with a problem in the study of the biology subject. The environment in the home and the participation of the parents show the highest correlation with learning difficulties in biology. Also, institutional variables are linked with problems in studying biology. In the district of Mardan, the availability of resources and the teaching method are significantly related to the learning difficulties in biology in secondary school.

Recommendations

1. Parental Involvement in Biology Learning: Parents can get knowledge from many sources, including meaningful conversations with their children, attending school meetings, interacting with Biology teachers and imparting the importance of biology in daily life. For example, explaining how plants go through photosynthesis and how the environment can affect this process. Additionally, parents can participate in simple activities such as a conversation with the child about the biology behind wet clothes drying on a hot summer day (evaporation and the water cycle) or a discussion about how our bodies control our temperature by sweating.
2. Available Resources: The resources and utilisation of the school are key factors in the biology learning difficulties. International standards publications, technical materials, well-equipped labs, workshops, conferences, scientific displays, field excursions, etc., are available. Government schools have budgets, and the resource needs are being complied with and checked, and a balance mechanism ensures that funds are utilised in the suggested areas. The government should provide authentic scientific education, like the advanced countries.
3. Teaching Methods: A very crucial aspect in scientific learning issues. Biology learning is limited and difficult with the teacher-centred technique. The instructor should better explain the biology learning difficulties. He may help the pupils by means of fresh teaching techniques, trends, experimentation and demonstration. Biology teachers in the government sector get good wages but often underperform. The government should keep a check on them and

An Examination of the Learning Difficulties Faced by Students in Biology at the Secondary Level in the District of Mardan

never hire instructors without competitive tests. Private school administrators should hire skilled teachers. Both sector instructors should get training and seminars.

4. Besides, families and schools may help kids overcome cognitive issues in biology topics. The current research found that the way our educational system works is based on traditional rote learning, while the way scientific courses work is not. School and home assignments could increase the cognitive abilities of pupils. Schools should also use the cognitive ability screening approach, which may be changed.

References

Afrianis, N., & Ningisih, L. (2022). Analisis kesulitan belajar siswa pada materi struktur atom. *Konfigurasi: Jurnal Pendidikan Kimia dan Terapan*, 6(2), 102-108. <http://dx.doi.org/10.24014/konfigurasi.v6i2.18617>

Akhter, N., Arif, S., & Akhtar, S. (2024). Socio-political and Religious Contributions of Sir Syed Ahmad Khan. *Al-Āfāq Islamic Research Journal*, 4(1), 158-165.

Aldila, M., Tapilouw, F. S., & Sanjaya, Y. (2018). Students' Cognitive and Attitude of Secondary School in Learning Global Warming Using Student Team Achievement Division (STAD) Based on Gender. *Journal of Science Learning*, 1(3), 104-109.

Almeida, L. B., de Almeida, L. B. P., Silva, L. P., de Andréa Pinheiro, H., & de Sousa Oliveira, E. (2023). *Revista Eletrônica Multidisciplinar de Investigação Científica*, 2(11). <https://doi.org/10.56166/remici.2311v2n11164>

Antonis, T. (2022). Learning Difficulties and Reading Comprehension in the School Performance of Students in the First Grades of Primary School. *Journal of Scientific Research and Biomedical Informatics*, 3(1), 1-5. <https://doi.org/10.31579/jsrbi.2022/026>

Azahra, C., & Wahyudi, M. (2024). Factor Analysis of Learning Difficulties in Independent Curriculum Science Learning in State Elementary Schools. *Science Get Journal*, 1(1), 8-18. <https://doi.org/10.69855/science.v1i1.24>

Babalwa, B., & Newlin, M. (2023). Impact of learning barriers on the academic performance of learners in selected secondary schools in Mtata. *International Journal of Education and Practice*, 11(4), 715-726. <https://doi.org/10.18488/61.v1i4.3491>

Bae, J., Shavlik, M., Shatrowsky, C. E., Haden, C. A., & Booth, A. E. (2023). Predicting grade school scientific literacy from aspects of the early home science environment. *Frontiers in Psychology*, 14, 1113196. <https://doi.org/10.3389/fpsyg.2023.1113196>

Belouiza, O., Er-Rechydy, A., & Koumachi, B. (2024). Prior knowledge Activation through the use of Effective Reading Strategies. *International Journal of English Literature and Social Sciences*, 9(3), 389-394. <https://dx.doi.org/10.22161/ijels.93.49>

Brod, G. (2021). Toward an understanding of when prior knowledge helps or hinders learning. *npj Science of Learning*, 6(1), 24. <https://doi.org/10.1038/s41539-021-00103-w>

Brundage, M. J., Malespina, A., & Singh, C. (2022, September). Peer interaction facilitates the co-construction of knowledge related to quantum mechanics formalism and postulates. In *Proceedings of the Physics Education Research Conference (PERC)* (pp. 70-75).

Chen, N., Zhao, K., Chen, I. H., & Liu, G. (2023). The influence of parent-child relationships on the learning adaptability of left-behind children: the mediating role of peer attachment and the moderating role of separation duration. *Frontiers in Psychology*, 14, 1108993. <https://doi.org/10.3389/fpsyg.2023.1108993>

Cinel, E. A. (2022). Overall Outlook of Education and Its Impact on the Economy in Turkey and OECD. *Journal of Social Sciences And Education*, 5(1), 1-13. <https://doi.org/10.53047/josse.1098877>

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied developmental science*, 24(2), 97-140. <https://doi.org/10.1080/10888691.2018.1537791>

Deng, Y., Cherian, J., Khan, N. U. N., Kumari, K., Sial, M. S., Comite, U., ... & Popp, J. (2022). Family and academic stress and their impact on students' depression levels and academic performance. *Frontiers in psychiatry*, 13, 869337. <https://doi.org/10.3389/fpsy.2022.869337>

Dere, Z. (2024). Does a scientific attitude and intelligence affect motivation towards STEM? Structural equation modelling. *Frontiers in Psychology*, 15, 1481229. <https://doi.org/10.3389/fpsyg.2024.1481229>

Dignam, C. (2023). Portraits of scientific inquiry and scientific literacy skills development in students. *International Journal of Academic Studies in Technology and Education*, 1(2), 94-112. <https://doi.org/10.55549/ijaste.28>

Dong, A., Jong, M. S. Y., & King, R. B. (2020). How does prior knowledge influence learning engagement? The mediating roles of cognitive load and help-seeking. *Frontiers in psychology, 11*, 591203. <https://doi.org/10.3389/fpsyg.2020.591203>

Faize, F. A. (2011). *Problems and prospects of science education at secondary level in Pakistan* [Doctoral Dissertation]. International Islamic University, Islamabad.

Fan, W., & Williams, C. M. (2010). The effects of parental involvement on students' academic self-efficacy, engagement and intrinsic motivation. *Educational psychology, 30*(1), 53-74. <https://doi.org/10.1080/01443410903353302>

Fatah, M. A., Fahiduzzaka, M. F., Shena, M. I., Ramadhan, M. R., Sakti, M. B., & Malikah, N. (2024). Implementasi Interaksi Kolektif Dalam Pembelajaran Bahasa Arab Di MTs Darul Huda Mayak Tonatan Ponorogo. *Dewantara: Jurnal Pendidikan Sosial Humaniora, 3*(3), 332-343. <https://doi.org/10.30640/dewantara.v3i3.2889>

Gousopoulos, D. (2023). Investigating students' scientific reasoning through heuristic and analytical thought processes. <https://arxiv.org/abs/2311.07158>

Gui, M. D., & Akuba, M. (2023). Analysis of Learning Difficulties in Class V Elementary School Science Material. <https://doi.org/10.59653/jemls.v2i01.369>

Hailikari, T., Katajavuori, N., & Lindblom-Ylinne, S. (2008). The relevance of prior knowledge in learning and instructional design. *American journal of pharmaceutical education, 72*(5), 113. <https://doi.org/10.5688/aj7205113>

Hayat, I., & Arif, S. (2024). Islamic Ethical Perspectives on Artificial Intelligence and Digital Surveillance: Principles, Challenges, and Policy Recommendations. *International Research Journal of Arts, Humanities and Social Sciences, 2*(01), 550-567.

Kang, J., & Yang, W. (2023, July). Research on teaching strategies to promote classroom interaction in a smart classroom environment. In *2023 International Symposium on Educational Technology (ISET)* (pp. 121-123). IEEE.

Ker, H. W., Lee, Y. H., & Ho, S. M. (2023). The impact of home resources, students' attitudes toward learning, and instructional strategies on science achievement. *Science Education, 107*(6), 1383-1398. <https://doi.org/10.1002/sce.21804>

Liu, X. (2024). Effect of teacher-student relationship on academic engagement: the mediating roles of perceived social support and academic pressure. *Frontiers in Psychology, 15*, 1331667. <https://doi.org/10.3389/fpsyg.2024.1331667>

Mao, P., Cai, Z., He, J., Chen, X., & Fan, X. (2021). The relationship between attitude toward science and academic achievement in science: A three-level meta-analysis. *Frontiers in psychology, 12*, 784068. <https://doi.org/10.3389/fpsyg.2021.784068>

Marchuk, O., Holliad, I., Boiko, V., Ribtsun, J., Bogdan, Z., & Lukashenko, K. (2024). Holistic Education: the Unity of the Intellectual and Emotional Sphere. *Revista Romaneasca Pentru Educatie Multidimensională, 2*(16), 666-677. <https://lib.iitta.gov.ua/id/eprint/741224>

Mazza, D. (2017). *La tarea en la universidad: cuatro estudios clínicos*. Eudeba.

Rafiuddin, M., Malik, S., & Waqar, S. (2024). A phenomenological study of the lived experiences of secondary school students with writing skills difficulties in English. *Al-Mahdi Research Journal (MRJ), 5*(4), 168-174. Retrieved from <https://ojs.mrj.com.pk/index.php/MRJ/article/view/315>

Rafiuddin, M., Waqar, S., & Ghafoor, H. (2023). Barriers to girls' education in rural areas of Mardan: Cultural norms, safety, and facilities. *Al-Mahdi Research Journal (MRJ), 5*(2), 564-576. Retrieved from <https://ojs.mrj.com.pk/index.php/MRJ/article/view/319>

National Academies of Sciences, Medicine, Division on Engineering, Physical Sciences, National Materials, Manufacturing Board, & Committee on a Vision for the Future of Center-Based Multidisciplinary Engineering Research. (2017). A new vision for center-based engineering research. National Academies Press.

Novianti, S., Sari, L. Y., & Afza, A. (2022). Factors that caused difficulty in learning science for students. *Journal Of Biology Education Research (JBER), 3*(2), 50-59. <https://journal.unpak.ac.id/index.php/jber>

Phil Canlas, I. (2024). Attitude matters more: The impact of perceived competence and attitudes toward science on science engagement among university students. *International Journal of Science Education, 1*-21. <https://doi.org/10.1080/09500693.2024.2354943>

Rauf, M. B., Parveen, S., & Naz, M. K. (2021). Importance Of Science And Technology At Secondary Level Education In Pakistan. *Pakistan Journal of International Affairs, 4*(1). <https://doi.org/10.52337/pjia.v4i1.407>

An Examination of the Learning Difficulties Faced by Students in Biology at the Secondary Level in the District of Mardan

Rizalia, S., Nopriansyah, S., Saefi, M., Adi, W. C., Damayanti, E., & Sukmawati, S. (2024). Students' Learning Difficulties Based on the Cognitive Level of Excretory System Material. *Journal of Biological Education Indonesia (Jurnal Pendidikan Biologi Indonesia)*, 10(2), 521-530. <https://doi.org/10.22219/jpbi.v10i2.32212>

Rusli, A., Gusmaweti, G., Hendri, W., & Sari, R. T. (2023). Relationship of External Factors Caused Students' Learning Difficulties and Biology Learning Outcomes in Class XI IPA MAN 3 Padang City. *International Journal of Education and Teaching Zone*, 2(1), 105-112. <https://doi.org/10.57092/ijetz.v2i1.57>

Sha, L., Schunn, C., Bathgate, M., & Ben-Eliyahu, A. (2016). Families support their children's success in science learning by influencing interest and self-efficacy. *Journal of Research in Science Teaching*, 53(3), 450-472. <https://doi.org/10.1002/tea.21251>

Shi, Y., & Qu, S. (2022). The effect of cognitive ability on academic achievement: The mediating role of self-discipline and the moderating role of planning. *Frontiers in psychology*, 13, 1014655. <https://doi.org/10.3389/fpsyg.2022.1014655>

Simbolon, J. P. A., Sihombing, S., & Simatupang, L. (2022). Pengaruh Percaya Diri Siswa Terhadap Motivasi Belajar dan Prestasi Belajar Siswa Pada Mata Pelajaran IPS Kelas VIII di SMP Negeri 9 Pematangsiantar Tahun Ajaran 2022/2023. *Jurnal Pendidikan Indonesia: Teori, Penelitian, dan Inovasi*, 2(6).

Tan, K. Y., Ng, K. W., & Ramasamy, K. (2024). Classroom Environment Analysis Via Internet of Things. *Journal of Informatics and Web Engineering*, 3(2), 19-36. <https://doi.org/10.33093/jiwe.2024.3.2.2>

Tawfik, A. A., Gatewood, J., Gish-Lieberman, J. J., & Hampton, A. J. (2022). Toward a definition of learning experience design. *Technology, Knowledge and Learning*, 27(1), 309-334. <https://doi.org/10.1007/s10758-020-09482-2>

Tzuriel, D. (2021). *Peers MLE Strategies*. 321–354. https://doi.org/10.1007/978-3-030-75692-5_11

Wang, M. T., & Eccles, J. S. (2012). Social support matters: Longitudinal effects of social support on three dimensions of school engagement from middle to high school. *Child development*, 83(3), 877-895. <https://doi.org/10.1111/j.1467-8624.2012.01745.x>

Wazir, M. A., & Goujon, A. (2019). Assessing the 2017 census of Pakistan using demographic analysis: A sub-national perspective (No. 06/2019). Vienna Institute of Demography Working Papers.

Widyasari, A., Pujiastuti, P., Nawangsari, N. S., & Anggito, A. (2022, January). Efforts to Increase Science Learning Outcomes by Increasing Interaction Between Students in Learning. In *the 5th International Conference on Current Issues in Education (ICCIE 2021)* (pp. 169-174). Atlantis Press.

Winarti, P. (2021). Analisis Kesulitan Belajar Mahasiswa dalam Perkuliahan Konsep Dasar IPA Fisika Secara Daring di Masa Pandemi Covid-19. *Jurnal Komunikasi Pendidikan*, 5(1), 93. <https://doi.org/10.32585/jkp.v5i1.1076>

Ybañez, Y., Ponce, J., Recaña, J., Cañete, J. J., Opingo, K. M., & Mangubat, R. (2024). Parental Engagement in Supporting Children with Learning Difficulties. *British Journal of Teacher Education and Pedagogy*, 3(2), 26–37. <https://doi.org/10.32996/bjtep.2024.3.2.4>

Yessa, F., & Marna, J. E. (2022). Analisis Faktor Kesulitan Belajar Siswa Kelas XI SMA Negeri 11 Padang dalam Mata Pelajaran Ekonomi. *Jurnal Salingka Nagari*, 1(2), 330-342. <https://doi.org/10.24036/jsn.v1i2.47>

Zhou, X., Shu, L., Xu, Z. Y Padrón, Y. (2023). The effect of professional development on in-service STEM teachers' self-efficacy: a meta-analysis of experimental studies. *International Journal of STEM Education*, 10(1), 1-20. <https://doi.org/10.1186/s40594-023-00422-x>