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# EXPLORING THE BARRIERS OF EXPERIENTIAL LEARNING STRATEGIES IN TEACHING BIOLOGY TO HIGHER SECONDARY STUDENTS IN PAKISTAN

[1]Mahmood Ahmed Dool, [2]Dr. Lubna Oad, [3]Dr. Naeem Akhtar

[1]*Assistant Professor, Department of Education, Sukkur IBA University, Sukkur*
[2]*Assistant Professor, Department of Education, Benazir Bhutto Shaheed University Lyari Karachi, Pakistan*
[3]*Associate Professor, Faculty of Social & Basic Sciences*
[1]mahmood.dool@iba-suk.edu.pk, [2]Lubnaparas@gmail.com
[3]drnaeem884@gmail.com

**Abstract**

The qualitative research study identifies the impediments toward experiential learning strategies for biology education in higher secondary education in Pakistan. The study evaluates the views of teachers, students, and education experts on institutional, pedagogical, cultural, and socio-economic barriers and hindrances condemning student-centered hands-on learning based on Kolb's Experiential Learning Theory. Data was collected through semi-structured interviews, focus group discussions, and classroom observations in selected urban and rural schools. The analysis identified themes as institutional constraints in the form of inadequate labs, rigid national and local curricula, exam-oriented system, and students' disengagement and lack of foundation knowledge, which limited further practical instruction. On the other hand, issues related to teachers such as lack of training, resistance to changes, and classroom management issues significantly restrict experiential learning. Additionally, socio-economic gaps and deep-rooted cultural values supporting rote learning and focusing on examinations rather than active learning were identified to be barriers. The study concludes with systemic reforms related to teacher training, curriculum design, resource allocation, and cultural perceptions to set forth an interactive and engaging learning environment in Biology classrooms. These research findings contribute valuable insights to policymakers and practitioners in education concerned about science education adjusting itself to global standards and Sustainable Development Goal 4 in Pakistan.

**Keywords:** Barriers in Education, Biology Education, Classroom Practices; Experiential Learning, Higher Secondary Education, Pedagogical Challenges

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## INTRODUCTION

### BACKGROUND OF THE STUDY

### OVERVIEW OF EXPERIENTIAL LEARNING

Experiential learning is viewed as a process in which experience is transformed into knowledge. Concrete Experience, Reflective Observation, Abstract Conceptualization, and Experiential Learning are the four processes that make up this experience - based education process (Kolb, 2014). Students are encouraged to actively engage in reflecting on their real-world experiences with learning applications through this approach. Over the years, experiential learning gained more momentum in education, thus helping critical thinking, problems, and solutions have deep understanding (Glen, 2016; Alabi, 2024). It becomes even more valuable in science education: it allows for inquiry-based learning and a student-centered approach (Morris, 2025; Sam, 2024).

### EXPERIENTIAL LEARNING IN BIOLOGY

In Biology, this is effective as experiential learning provides the opportunity for students to engage actively and practically interact on scientific topics with laboratory experiments, dissections, fieldwork, and real-world problem-solving (Apeadido et al., 2024; Ahmad et al., 2022). Such experiences help students grasp complex biological concepts that would otherwise need to be learned using more traditional methods (Wang et al., 2023). Students taught through experiential learning in Biology showed improvement in academic performance, motivation, and science (Gisoi et al., 2023).

### BIOLOGY EDUCATION IN PAKISTAN

Biology education in Pakistan in higher secondary schools has mostly been teacher-centered, lectures, and textbook-based in learning (Erumit & Akerson, 2023). The national curriculum prescribes the theoretical aspects of learning or examination instead of scientific inquiry and practical activities (Liswaniso, 2019). However, the laboratory period is the curriculum part but limited in numbers, lacking the required infrastructure, equipment, and trained staff to carry out effective experiments (Ahmad et al., 2022; Araneda et al., 2018).

### NEED OF STUDY

Understanding the test of Experiential Learning in Pakistani schools becomes important because traditional teaching methods are not up to the mark in terms of making students participate in critical thinking and analytical skills (Jamil & Muhammad, 2019). Students memorize biological facts without knowing the application expertise to use them in the real world. All this reflects that the present teaching method falls short of preparing the students in all considered dimensions for higher studies or jobs in the field of science (Drymiotou et al., 2021). Mapping the barriers in the experiential learning aspect helps in strengthening the linkage between curriculum and classroom practice.

### PROBLEM STATEMENT

Experiential learning has been proven to facilitate deeper understanding and critical thinking as well as active student involvement; however, it is not commonly experienced within Biology classrooms in Pakistan (Kolb, 2014). Schools do not support the effort of the higher secondary teachers in their practice of experiential learning, and the resources are limited as well as the inadequacy of training (Fenta, 2019). Such hardships ensure that hands-on activities like vivarium experiments, fieldwork, and inquiry-based learning, which are the minimum requirements for effective Biology teaching, disappear (Nwankwo et al., 2024). This is why the traditional lecture-based teaching method would continue very well and lead to passive learning and less involvement of students in direct learning

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(Afzal & Rafiq, 2022). Therefore, the issue affects the quality of science education and also limits real-world applications of biological concepts for students (Dare et al., 2021). This makes it practical to define the causes of the failure of Biology teachers in employing experiential learning strategies and means to reform science education in Pakistan.

**RESEARCH QUESTIONS**

1. What are the main challenges which teachers face while implementing experiential learning strategies for teaching Biology in higher secondary education levels in Pakistan?
2. How do students understand and participate in Biology learning through experiential learning strategies?
3. What are the different institutional and cultural barriers that impede the efficacious use of experiential learning in the teaching of Biology?

**RESEARCH OBJECTIVES**

1. To find the barriers to the implementation of experiential learning in the teaching of Biology in Pakistan.
2. To delve into the perceptions of teachers and students regarding the experiential learning aspect of the Biology curriculum.
3. To discuss the institutional, cultural, and socio-economic considerations that determine the adoption of experiential learning strategies.

**SIGNIFICANCE OF THE STUDY**

This study was to provide Biology teachers with useful knowledge that would help them understand the challenges keeping them from using experiential learning strategies in their classrooms. Awareness of all such challenges creates more student-centered teaching methods that are flexible enough to cater to the present-day learner (Afzal & Rafiq, 2022). In narrowing the focus on practical problems that teachers face, this study added a voice to evidence-based discussion on improving science education (Georgiou et al., 2023).On the policy front, the findings of this study may be used to enhance educational reforms in Pakistan, particularly concerning curriculum design, teacher training, or resource allocation for science labs and hands-on learning environments (Zafeer et al., 2024). The study further backs national education goals as aligned with Sustainable Development Goal number 4, which targets inclusive and quality education for all, especially in STEM (Kulshreshtha et al., 2022; Hogan & O'Flaherty, 2021).

**SCOPE OF THE STUDY**

The study was undertaken in some selected higher secondary schools, both urban and rural, in Pakistan, in order to give representation to different types of educational settings. Biology teaching for grades 11 and 12 was focused, particularly looking at several experiential learning methods as applied to topics in human physiology, genetics, and ecology. The research examined several activities: lab work, fieldwork, and group problem-solving assignments, which constituted experiential learning methods (Bahri et al., 2014).

Due to time and logistical hurdles, the study was limited in scope to the number of teachers and schools, potentially undermining the broader applicability of the findings. Reliance on qualitative methods such as interviewing and observation for data collection has also been made all over the study, and it thus may not cover teaching practices in full breadth across the country (Leko et al., 2021).

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## LITERATURE REVIEW

### THEORETICAL FRAMEWORK OF EXPERIENTIAL LEARNING

Kolb's Experimental Learning Theory posits experience as a major source of knowing or learning. Four stages- Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE)- all form the definition of the learning cycle with four stages (Kolb, 2014). The stages concern how learners engage with an experience: they think back on and conceptualize their experience to apply it to concrete situations (Kolb 2014). Kolb emphasized that learning occurs more efficiently when this entire cycle is incorporated into the experience of learners, especially producing a balanced development of practical and theoretical insight (Nurunnabi et al., 2022). The influence of John Dewey's ideas on Kolb's theory was also striking. According to Thomassen and Jørgensen (2020), education should be grounded in real-life experiences, where students reflect upon those experiences and make sense of them to create meaningful knowledge. Dewey's idea of learning by doing is connected especially strongly with theory and practice in the sciences (Ye & Shih, 2021). Dewey believed that an actively engaged student learns by engaging in learning activities that provoke inquiry and problem-solving, which are paramount in fields like Biology (Dewey, 1938).

Active learning, learning by doing, and reflective practice are the three pillars of modern pedagogy-active learning is an instructional method that makes students engage in doing things and thinking about what they are doing. As a result, it yields positive results in the teaching and learning of science (Freeman et al., 2014; Atchia, 2021). Thus, learning by doing articulates the value of practical experiences such as lab work and field activities to help Biology students grasp complex biological concepts (Georgiou et al., 2023). Reflective practices, i.e., revisiting to improve one's future learning, have been suggested to enhance student understanding and self-regulation (Ateş & Polat, 2025). The combination of these approaches in teaching Biology can further provide students with the bridge between theory and real-life learning, enhancing both their academic and practical experiences in science education.

### EXPERIENTIAL LEARNING IN SCIENCE EDUCATION

Experiential learning comprises the widely practiced pedagogical practice in science where students do actual doing. Research confirms that active learning methods lab experiments, field trips, and interactive simulations--are very good at involving students while helping them learn and remember in subjects like Biology (Freeman et al., 2014; Atchia, 2021) for instance, it has been shown in a study carried out in the USA that students who have studied Biology through experiential courses have learned better and retained more than their counterparts who underwent a traditional lectures course (Gisoi et al., 2023). Similarly, another European study relates fieldwork or other types of real-world activities with student participation and learning of complex biological processes in science education (Atchia, 2021). Those activities allowed the students to visualize biological concepts and interact with them for a better understanding and longer retention (Jamil et al., 2023).

Experiential learning is still limited in terms of science classrooms in Pakistan but has recently started coming to focus. Generally, a few studies relate to practical teaching of methods in public and private schools, most of them from urban areas. A study conducted by Mapulanga & Bwalya (2024) found that teachers who incorporated hands-on activities such as science experiments and field trips motivated students and enhanced their understanding of biological concepts. Some of the impediments to widespread application include lack of resources and insufficient teacher training, as well as examination- and

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output-focused teaching approaches (Dare et al., 2021). Some metropolitan schools, however, have had good results, with students showing higher enthusiasm and participation during lessons (Ahmad et al., 2022).

The importance of experiential learning has been recognized and appreciated by the extensive literature in the field of Biology education. The learning thereby helps the students grasp the concepts more clearly and transforms them into very vital skills like critical thinking, problem-solving, and teamwork. Studies prove that if students participate actively in experiments or even in solving problems based on reality, they get very effective self-analytic and self-evaluative skills (Miller et al., 2020). The practice also cultivates critical thinking about biological phenomena, leading to a readiness for students to apply theory to practice. Incorporating experiential learning also increases student motivation when one does real-life examples in a class (Dare et al., 2021). Overall, experiential learning generates a lively and vibrant classroom atmosphere, which helps provide behavioral learning support to both the cognitive and emotional aspects of learning in Biology.

## BARRIERS TO IMPLEMENTING EXPERIENTIAL LEARNING

### INSTITUTIONAL BARRIERS

Those institutional impediments obstruct the path of experiential learning in studying Biology in Pakistan. Curriculum rigidity and strong concentration on theoretical content leave little room for hands-on activities in educational practice, regarding them as optional rather than core to the learning process (Nwankwo et al., 2024). Many schools do not have an adequate supply of laboratory equipment, space for practical activities, and fieldwork facilities; thereby making it almost impossible for teachers to apply experiential learning (Dogar et al., 2025). Large class sizes are making it even more difficult for teachers to give the individual students needed attention during hands-on activities which lowers participation and engagement levels among students (Mapulanga & Bwalya, 2024). Furthermore, the traditional approach of focusing on memorizing and examination in the education system of Pakistan contradicts experiential learning, which lays emphasis on understanding, critical thinking, and problem-solving (Freeman et al., 2014; Jamil et al., 2023) thereby depriving poor students of fully enjoying the benefits of hands-on activities in the classroom.

### TEACHER-RELATED BARRIERS

Teachers in Pakistan face enormous problems when they attempt to apply experiential learning in Biology classrooms. The other basic problem is that they do not get trained in experiential learning teaching methods, as most teachers have been trained to lecture (Diem et al., 2024). There are no professional development programs offered on student-centered hands-on teaching that prepare teachers to integrate experiential learning (Afzal & Rafiq, 2022). Resistance to change also prevails among teachers who are not ready to change their mindset and practice to adopt new teaching strategies (Dogar et al., 2025). Classroom management becomes another obstacle where teachers find it a bit difficult to keep discipline and all the students excited during practical activities like experiments or group projects (Miller et al., 2020). The training lack in those aspects also brings forth the unwillingness among teachers to practice experiential approaches.

### STUDENT-RELATED BARRIERS

Several student-related barriers prevent the successful implementation of experiential learning in Biology education. One of the main hindrances is the lack of engagement, particularly in rural or underprivileged settings where students often show little interest in science (Diem et al., 2024). Many students also feel that hands-on activities are

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unimportant in the process of passing an examination (Zafeer et al., 2024). Additionally, students often lack the requisite background knowledge to make the experiential learning activities more meaningful, as these activities require a basic grasp of theory to apply practically (Mapulanga & Bwalya, 2024). Socio-economic factors come into the picture since low-income families often find it hard to participate in activities like field trips because of financial limitations (Ahmad et al., 2022). Therefore, the limited understanding and lack of interest on the students' part are major impediments to implementing experiential learning in classrooms.

**CULTURAL AND SOCIETAL BARRIERS**

In Pakistan, cultural and societal factors significantly hinder the incorporation of experiential learning into school curricula (Asad & Kramer, 2024). Rote learning with an emphasis on examinations is more or less the order of the day; this factor greatly affects the education system and the expectations of the students (Kim et al., 2019). In such an exam-driven culture, the value of experiential learning is diminished because students, as well as parents, have come to equate academic success with examinations and memorization rather than with conceptual understanding (Ahmad et al., 2022). Historically in Pakistan, science was considered an elitist subject, and therefore society is far less invested in the modernization of the methods of teaching others (Mustafa et al., 2022). In this education system, the pressure to prepare for the uphill examinations has had no room for student-centered, experiential teaching strategies. It would take not only a change in the classroom but also a change in the culture surrounding the social relevance of science education in Pakistan in order to move into a more interactive and student-centered domain.

**METHODOLOGY**

**RESEARCH DESIGN**

The study utilized a qualitative research design that was considered adequate for the exploration of complex and context-specific barriers inhibiting the implementation of experiential learning strategies into Biology education. Through a qualitative approach, the in-depth exploration of the participants' perspectives and their deep understanding of the difficulties faced was attained. For instance, in this particular study, case studies were used where six higher secondary schools were selected in Pakistan, three from urban and three from rural locations, to generate rich and detailed findings. Hence, the design was appropriate for investigating multiple perspectives and revealing the key factors responsible for the poor integration of experiential learning.

**PARTICIPANTS**

The participants involved in this investigation were ten Biology teachers and thirty students from the secondary level hailing from five purposively chosen high schools. These institutions represent different schools to give more experience. They are both rural and urban schools to represent houses with varying educational environments. For teacher selection, there were considerations for years of teaching experience, experiential teaching methods employed, and representation in selected schools. This ensured that different teachers working in different environments had the possibility of accessing materials and not accessing them when implementing hands-on learning strategies. Based on active participation in Biology lessons and the willingness to participate in the study, student participants were selected. Consideration was given to diversifying academic performance and numbers representing each of the five schools to obtain a wider perspective. That way, the common and peculiar problems were well captured as experienced in the context of experiential education.

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## DATA COLLECTION

The methods of data collection focused on three primary qualitative methods: semi-structured interviews, focus group discussions, and classroom observations. Semi-structured interviews were held with the 10 chosen Biology teachers to study their experiences, perceptions, and the particular challenges encountered while integrating experiential learning into their professional practices. Having the flexibility to further explore the schemes emerging from the teachers' responses while allowing for clarity or elaboration of specific responses expressed as the ideal tool for capturing nuanced positions. The focus group discussions, in a total of 30 students, were split into smaller student groups of 5–7 students per session. These group interactions were often representative of common opinions but also included diverse opinions that aided in a broader understanding of student engagement and perceived barriers. Classroom observations were also conducted in each of the 5 schools where applicable to provide immediate insight into the operation of these experiential learning strategies during actual teaching. Observations focused mainly on teacher-student interactions, the organization of experiential activities, and challenges met while delivering his/her classroom.

## ETHICAL CONSIDERATIONS

Data collection was conducted following the ethical approval of the Institutional Review Board of higher secondary schools before the real database. In all cases, informed consent was obtained from respondents, whose anonymity, confidentiality, and right to refuse participation were guaranteed through entire studies. All the participants involved were briefed about their freedom to withdraw from the study at any point of time without any form of penalty.

Pseudonyms were given to or the data was kept confidential and secure. The researchers declared that there was no conflict of interest concerning the research activity.

## DATA ANALYSIS

The qualitative analysis was conducted through thematic analysis. This sustained the initial familiarization with the data through transcription and thorough reading of the data, thereby putting the initial codes in the process of identifying significant features of the data, grouping related codes to arrive at broader themes, and then reviewing and refining those themes to reposition them with what the data depicted and what the research questions posed by the study consisted of. Both inductive and deductive coding strategies were applied so that new insights could emerge as well as fulfilling certain aims of the study. The systematic analysis was structured to allow the establishment of recurrent patterns and themes about the barriers and challenges of experiential learning in Biology pertinent to the experiences of teachers and students. It is in this spirit that the findings add value to the scholarship of science education, therefore, promoting the development of better and more inclusive learning environments.

## FINDINGS AND DISCUSSION

### OVERVIEW OF THE BARRIERS IDENTIFIED

Experiential learning methods in Biology classrooms at the higher secondary level in Pakistan come up against several serious barriers. Four major groups identified these barriers-teacher-related, student-related, institutional, and cultural factors (Akhtar, 2020; Gaw et al., 2022). Teacher-related barriers are training inadequacies, resistance to change, and classroom management problems. Student-related barriers would include lack of engagement, erroneous cognition about learning, and socio-cultural factors limiting active participation in learning. Institutional barriers refer to a lack of resources like laboratory

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equipment and proper infrastructure. Cultural barriers refer to a preference for rote memorization and exam-based learning, which further discourages hands-on learning (Nwankwo et al., 2024).

**TEACHER-RELATED BARRIERS**

**LACK OF TRAINING**

A major barrier acknowledged is the lack of training of teachers; thus, experiential learning strategies became difficult to implement successfully. Many teachers said they had not received any professional development in the area of student-centered or hands-on teaching methods (Akhtar et al., 2021). As one teacher stated, *"I haven't received formal training on how to use practical activities effectively in the classroom. We are mostly trained to teach through lectures and textbooks."* This lack of training was reported as a challenge for urban and rural teachers alike (Akhtar, 2020). Teachers need specific skills for experiential learning, for example, guiding students through observation and active experimentation (Cheng et al., 2019). Lacking these skills, teachers struggled to create environments for students to engage in hands-on activity (Jamil et al., 2021).

**RESISTANCE TO CHANGE**

Another major hurdle was the resistance to change. Growth was induced in experiential methods by inhibitions felt by teachers used to teaching in traditional lecture ways. A certain teacher stated, *"The old methods are easier and familiar to me. Trying something new feels risky, especially when the curriculum is already overloaded."* Factors causing such resistance were fear of failure, examination pressure, and difficulty in slotting in new methods in already packed syllabi (AlQuraishi & Sorger, 2021; Dogar et al., 2025). In the rural setup, teachers also thought that what they were doing in the name of experiential learning may not really fit into the expectations of parents and administrators (Akhtar, 2020).

**CLASSROOM MANAGEMENT**

The next issue was classroom management during hands-on activities. Teachers would often find it difficult to engage students in practical lessons. A comment from one teacher stated, "*When we try to conduct an experiment or a field trip, managing the class becomes a nightmare. Some students lose focus, and it becomes difficult to ensure that everyone is participating."* This was compounded by large class sizes and too few staff to assist in the classroom (Akhtar et al., 2021). Classroom management becomes more challenging when dealing with large classes that are common in Pakistan (Almasri et al., 2021). In the absence of good classroom management, opportunities for experiential learning would often result in diminished engagement from students and disruption of lessons (Pherson-Geyser et al., 2020).

**INSTITUTIONAL BARRIERS**

**LIMITED RESOURCES**

There is also this major institutional barrier: lack of resources. Many teachers mentioned how lacking proper lab facilities and equipment made it difficult to utilize experiential learning strategies (Gaw et al., 2022). *"We just do not have the materials needed to carry out those practicals. We cannot afford to buy microscopes, slides, or other essential lab equipment,"* said one teacher. Especially in rural schools, poor infrastructure hampered such activities in schools (Shah Bukhari et al., 2022). Without the right resources, teachers find it hard to conduct hands-on activities (Gaw et al., 2022).

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**CURRICULUM CONSTRAINTS**

Another institutional barrier was an examination-driven curriculum. The Curriculum of most schools in Pakistan contains theoretical concepts and very little space for practical work (Dogar et al, 2025). One teacher says, *"The curriculum is so loaded in theory that we hardly get time to conduct practical work even knowing how important it is."* Thus, the pressure came on teachers to emphasize exam content instead of interactive and hands-on learning activities (Akhtar, 2020). Due to the rigid nature of the curriculum in Pakistan, also creates a barrier for teachers to use experiential learning methods because these have no direct relationship with the examination-focused system (Almasri et al., 2021).

**STUDENT-RELATED BARRIERS**

**LACK OF ENGAGEMENT**

A major barrier to learning among students was a lack of interest in hands-on learning. Some students did not see the importance of practical work and preferred to stick to books (Mapulanga & Bwalya, 2024). As one student put it, *"I do not think we really need practical work in biology. We just need to read the book."* Such lack of motivation was most pronounced among students who were accustomed to didactic teaching methods (Almasri et al., 2021). Deep learning must engage students, but, without motivation, experiential learning is ineffective (Akhtar et al., 2021).

**INSUFFICIENT BACKGROUND KNOWLEDGE**

Another barrier to successful experiential learning was that many students did not possess adequate prior knowledge in Biology. As a teacher described it, *"Students often find it difficult to connect what they learn in experiments to the theoretical content because their basic concepts are not clear."* This was a bigger hindrance for students from lower academic backgrounds, who didn't have the foundational knowledge needed for complicated practicals (Dogar et al., 2025). Gaps in basic knowledge could handicap experiential learning, especially in Biology (Jamil et al., 2021).

**SOCIO-ECONOMIC FACTORS**

Furthermore, socio-economic challenges related to student participation in hands-on activities. Most students from low-income families could not afford the costs of field trips or any other practical learning experiences (Shah Bukhari et al., 2022). One teacher said, *"Not all students can afford the transportation costs for field trips, and sometimes we have to cancel them because some students cannot participate."* These financial barriers restricted opportunities for some students to take advantage of vital out-of-classroom learning experiences (Gaw et al., 2022). Social differences in Pakistan limit the scope of extra-curricular learning, including field-based experiential learning (Pherson-Geyser et al., 2020).

**CULTURAL AND SOCIETAL BARRIERS**

**TRADITIONAL TEACHING CULTURE**

Pakistan has a cultural inclination towards traditional teaching methodologies. Various teachers, including Dogar et al. (2025), have indicated that both students and their parents prefer lecture-based teaching as this mode of learning is believed to be more effective, keeping in view the examination system. One teacher said, *"Parents and even some students think that lectures are the only way to learn. There is general resistance to anything that seems too different from what they've experienced before"*. Such emphasis on rote memorization and passive learning conflicted with interactive experiential learning (Shah Bukhari et al., 2022). In Pakistan, different methods are most often preferred, thus making it difficult to adopt newer strategies such as experiential learning (Akhtar, 2020).

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**PERCEPTION OF SCIENCE EDUCATION**

In Pakistan, science education is seen as memory work instead of hands-on learning (Akhtar et al., 2021). As one biologist education expert said, *"In our culture, science education is about knowing facts, and the hands-on approach is often viewed as unnecessary or too time-consuming."* This cultural view makes it impossible to make more interactive and student-centered approaches to learning sciences. Furthermore, they tend to see science as a subject that memorizes, not as a subject that explores (Pherson-Geyser et al., 2020). The cultural attitude that surrounds science would limit the development of innovative teaching practices such as experiential learning (Akhtar, 2020).

**DISCUSSION OF FINDINGS IN THE CONTEXT OF LITERATURE**

Thus, the findings of this study are largely in keeping with existing research about the barriers to experiential learning in science education but raise new questions relevant particularly to the Pakistani context.

**INSTITUTIONAL BARRIERS**

Limited resources were also found to be a major constraint in this study, just like much of the global research showing that lack of infrastructure actually hinders experiential learning (Akhtar, 2020; Gaw et al., 2022). It was also found that these problems worsen in rural areas where basic resources are even lacking. Such a regional disparity was, however, not much discussed in previous studies (Shah Bukhari et al., 2022).

**TEACHER-RELATED BARRIERS**

The absence of training and the resistance to change found here have also been documented in other studies (Akhtar, Aslam, Hussain & Memon, 2021; Diem et al., 2024). Teachers often find it difficult to bring about new changes in the ways of teaching due to a lack of training, which is common in developing countries. In these countries, teachers mostly lack skills for engaging students in active learning (Jamil, Muhammad, & Qureshi, 2021). However, the study found classroom management is a unique problem in Pakistan as large classes and no support staff compounded the problem faced by teachers with practical hands-on activities (Mapulanga & Bwalya, 2024).

**STUDENT RELATED BARRIERS**

Unattended engagement and little background knowledge were also barriers in some other previous studies (Almasri et al., 2021). However, these mostly occurred with additional deleterious effects in Pakistan by rote memory cultural preference and exam-based education systems (AlQuraishi & Sorger, 2021). Poor students also received less hands-on exposure (Akhtar, 2020; Gaw et al., 2022).

**CULTURAL AND SOCIETAL BARRIERS**

Cultural resistance towards change was one of the major obstructions according to this study, which complements other researchers' findings that in most Asian cultures, the emphasis is on memorization called hands-off experience (Pherson-Geyser et al., 2020). In Pakistan, societal pressure from parents and administrators for exam results worsened this situation for the teachers to try anything new in teaching methods (Shah Bukhari et al., 2022).

**CONCLUSIONS**

The Research findings of this study have revealed the nature of problems involved in implementing experiential learning in Biology education in Pakistan. Although the advantages of hands-on and inquiry-based approaches are sufficiently known, the transition of pedagogy from traditional to experiential teaching is still obstructed by many interrelated barriers. These are teacher-related, student-related, institutional, and cultural

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challenges that collectively undermine their effectiveness and feasibility of applicability for experiential learning in a classroom.

Among the obstacles put by teachers, barriers appear to be the most serious. Most of the teachers have inadequate training in experiential teaching methods, which bars them from legal deployment of such methods, not to mention their mastery of the skills required for their application. There is more resistance from the teachers, which comes from unfamiliarity with the fresh approaches, and sometimes even fear of losing control of the classroom. The other factor that adds difficulty is active learning since teachers can hardly manage their classrooms with these kinds of activities because they feel unsupported and ill-prepared.

At the level of student involvement, there are many factors that hinder experiential learning. Student disengagement, compounded by a poor overall knowledge base in Biology, creates a learning atmosphere that does not encourage participation in hands-on activities. There are socio-economic constraints that presently limit the many opportunities and resources used to promote experiential learning. Such restrictions even hinder access to co-curricular and practical experiences among most disadvantaged students and widen the learning gap. Other institutional disabilities hinder experiential learning. The limited availability of laboratory equipment and space nearly forbids practical scientific experimentation. However, although faculty and students will express their willingness to interact enthusiastically with the experiential learning process, still, the lack of institutional support structures compromises the quality of the experiential process at the institution. The exam-oriented education system practiced in this country favors rote learning and theoretical perspectives at the expense of practical and student-centered learning experiences. Such a curriculum structure, which makes examination recognition more important than deep meaning, equates to the opposite of experiential learning principles.

Cultural attitudes towards education, as deemed here, provide a crucial contextual backdrop. The standing value system of rote-learning, sanctioned by societal expectations and uncovering assessment methods, brings about an overall cultural resistance towards changes. Teachers and institutions are cautious in altering their established practices because they fear that their non-conventional teaching approaches may not generate the respective examination results the system demands. This cultural bias continues to keep experiential learning beyond the mainstream; instead of being merged into core teaching activities, it becomes an add-on.

The barriers to experiential learning in Biology classes in Pakistan are well rooted beyond the barriers of pedagogy, student preparedness, institution infrastructure, and culture. Each of these elements is significant and combines with the other factors to compound the impact of reducing innovation in education. All would have to be shaped in a holistic approach towards fostering change in teacher training, curriculum reforms, infrastructure investment changes in cultural perceptions concerning learning before the education system can hope to adopt experiential learning and prepare students with the skills and understanding to engage meaningfully with scientific concepts and reality.

**IMPLICATIONS FOR BIOLOGY EDUCATION IN PAKISTAN**

The findings of this study are an imperative to enter change in the Biology Education in Pakistan. First, there should be some improvement in teacher training so that, they can train the teachers to use experiential learning methods effectively. Training programs must

be designed specifically to develop those who can teach as well as plan hands-on activity-based learning.

Schools must also have more resources like well-equipped laboratories and spaces for experiments. Curricular changes should also include the allocation of time for learning through interaction. Lastly, it should ensure the cultural shift in education, that is, to move from rote memorization and examination results into activities that further encourage active learning. These changes would provide a more engaging environment for learning, and it would also be student-driven.

**RECOMMENDATIONS**

Based on the results, therefore, suggestions are made to help overcome the barriers and promote the application of experiential learning in Biology education:

1. Teacher training programs need to be invested and concentrated on experiential learning. Workshops and in-service training should include training on how teachers can incorporate experiential activities into their Biology lessons.
2. The Biology curriculum should be redesigned to give more flexibility and time for experiential learning. The curriculum should apply biological concepts to real-life situations and stimulate critical thinking and problem-solving abilities.
3. Resources are needed to allow modern biology precise lab experiments, donor funding for field trips, and complete access to modern educational technologies. The authorities and educational institutions should join hands to secure appropriate funds for such resources.
4. Students need to get involved in the whole learning process. Schools should include activities directed toward different learning styles and motivate students to take charge of their learning via project work, experiments, and fieldwork that extends from theory to practice.
5. This need should challenge the traditional set norms of rote memorization with exams. Educational policies should ensure more self-directed, interactive modes of teaching and learning so that experiential learning may thrive.

**AREAS FOR FUTURE RESEARCH**

There must be subsequent studies to better comprehend experiential learning in the context of Biology education in Pakistan. Future studies could evaluate activity-based instruction geared toward field trips or laboratory experiments and how these settings engage students in Biology and deepen their understanding of it.

Research can also assess barriers to experiential learning in other sciences, such as Physics, Chemistry, or Mathematics, to see whether other subjects bear any similar adversities. Long-term studies may focus on the impact of experiential learning on students' academic performance and career choices in the years afterward. It would finally also help to gather the views of parents, policymakers, and school administrators about societal and institutional issues affecting the successful execution of experiential learning in schools.

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