



Factors Affecting the Implementation of Inquiry-Based Teaching in Science Classroom: A Teachers' Perspective

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ABSTRACT

Inquiry Based Teaching (IBT) has become significant instructional strategy in science education. IBT has been used as an effective instructional strategy to promote science learning among the students, globally. It has positive impact on students' science learning. In spite of having many advantages, Inquiry Based Teaching (IBT) is not widely used in Pakistan. In Science classrooms Inquiry-Based Teaching (IBT) implementation is a challenging process that calls for certain classroom setups and instructional resources to involve students in tasks. While implementing IBT, teachers often face challenges to get desired learning outcomes. There are factors which resist teachers to implement IBT in science classrooms. This study explored teachers' perceptions about IBT and the factors which affect the implementation of IBT in science classrooms. In order to achieve the objectives of this study, Semi structured interviews were conducted from elementary science teachers. Purposive sampling technique was adopted to select the participants to collect the data. This study has been conducted in the context of Sukkur, Sindh. The analyzed data revealed factors like fixed classroom timing, lack of learning resources, assessment criteria, restrictions from management and students' learning background resist teachers to implement IBT in science classroom.



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Introduction

The quality of standards of education are considered main pillars for the progress of any nation. In addition, various factors are there which affect these standards like effectiveness of educators, performance of students, and the facilities and infrastructure provided to educational institutions (Nurulwati et al., 2020). Moreover, the current era of technology demands to have expertise on skills like cooperation, collaboration, innovation, communication, and critical thinking not just to have theoretical knowledge (Anugrah, Anggraeni, & Syaifullah 2025). Such capabilities assist individuals in overcoming the perplexing problems and continuing global barriers (Fadliya, Putri, & Huda, 2024). Thus, adopting it has become a pre-requisite for educational organizations to opt

innovative and learner-centered approaches for producing flexible graduate who can could be fit into the dynamic job market. This kind of requirement further put stress to give attention to integrate real learning across different course, including science.

Students usually consider science as more difficult subject than others because requires more time to comprehend its abstract concepts and mathematical verifications (Rasyid et al., 2025). In addition, traditional method of teaching makes students passive learners as it does not allow them to participate actively in classroom activities (Susanti et al., 2021). Resultantly, efficiency of children in gaining conceptual understanding becomes inefficient, mandating educators to arrange modern teaching strategies focusing innovative and student-centered, it further clarifies the significance of IBT. On other hand, equipping them with knowledge of science is really important to survive easily in current age of technology (Zudaire et al., 2022). Learning science is not only helpful in terms of academic but also assist them to get them fit in 21st century (Bao & Koenig, 2019). As per findings of report of international students' assessment (PISA) achievement of students in science subjects in developing countries is below international average (Ayu et al., 2025).

Keeping in view the above global scenario it can be clearly seen that there is gap between the objectives of learning and real outcome, forcing teachers to bring influential learning ways to enhance the learners' academic outcomes-among those inquiry based teaching one of major objectives to be achieved. IBT is a defined as a problem-based method in which teacher put students in an investigation process, same as scientists do, where they explore the things on their own pace to discover something new (Kousloglou et al., 2023). By doing so every students get a chance to learn actively using exploration, hands-on practice, and data analysis (Pedaste et al., 2015; Slapnicar et al., 2024). Research of Gomez (2025) showed a clear comparison between the traditional and inquiry based teaching. It was mentioned in his study that IBT is suitable when teacher is intending to enhance involvement of young learners by deepening their understanding regarding concepts of science on the contrary, traditional method does not allow learners to take part in any activity in classroom. In conventional method teacher has authority of knowledge and acts as a main role while, in IBT his role is to facilitate learners with learning material and empower them of knowledge (Furtak et al., 2012). Hence, it is one of finest approaches for surging quality of science education. A basic mechanism of education for human growth, specifically in enhancing the skills of higher order thinking for overcoming barriers in learning science subjects. While, it is also a major objective in science education to develop scientific approach and creativity. Pupils who are good at scientific creativity are more capable of, solving problem with logic, create new discoveries, and add something new to innovations of science. According to the findings of OECD (2014, 2019, 2023) students in China performed brilliantly in various assignments in science at international level and their results in assessments related to creativity are disappointing (Park et al., 2021; Wong & Niu, 2013).

Literature Review

IBT stand for inquiry-based teaching. The ultimate aim of IBT, as per Council for National Research (2012) is fostering deep thinking, drawing solution of a problem, and liberating individuals scientifically. It promotes engaging learner and create in them a courage to investigate, raising questions, and participating actively in learning procedures that reflects practices of professional scientists". Authorities have remained conscious about advancing

inquiry based instruction, putting more focusing on integration of core content through scientific protocols for example making models, assessing data, and making conclusions (McNeill et al., 2016). Practicality of liberating people with science has been emphasized many years ago (Schwab, 1962). Further, it was also added in the study that inquiry is not about gaining mastery on facts rather interpreting them situationally, which depends on the fundamentals of inquiry.

The Literature has referred IBT with different lens. As per Lee and Shea (2016) pointed out IBT as an approach with full of choices, motivating children to raise questions, gather information in raw form, draw out causes and explain them based on compiled data. It is approach adopted by teachers to involve students in subjects they are striving like mathematics. Students escalate enthusiastic about booming outcomes by observing, creating a hypothesis, planning inquiries, carrying out experiments, and final data analysis and interpretation (DeRosa & Abruscato, 2014). Literature is full of evidences and examples indicating importance of indirect strategies like IBT and IBL. A notable example is of Knight and Wood (2005) who uncovered that once pupil are involved in an engaging environment rather than a conservative environment, they obviously, have more learning gains. Additionally, teachers have an exciting role to play, as they encourage students to immerse in classroom tasks, inspiring their queries based on examination and exploration, and making new discoveries by employing constructs they have learned (Vande Walle et al., 2014; Rosa & Abrucato, 2014). Teachers who have attended training sessions utilize this approach evaluate the ability of the problems that are asked in classes and on exams in order to help learners by uplifting them to creating level of Blooms Taxonomy (Bloom et al., 1956). It is worth noting that research on IBT illustrates its strengths and nurtures its usability in science (Anderson, 2002; Marx et al., 2004; Jerrim & Sims, 2019). Furthermore, its weightage has been recognized in a multiple documents of National Curriculum for Science, particularly in Pakistan (GOP, 2006). A critical belief that IBT bolsters and surges students understanding and productivity in science could be underlined by the presence of IBT in above mentioned documents.

Inquiry spectrum

IBT exemplifies a vibrant and multi-dimensional approach for teaching science, rooted in real time practices of scientific investigation. The main idea of inquiry is involving learners in questions which are testable, planning investigations properly, assessing information gathered, and making conclusions which are evidence based for further deepening understanding (Wilcox et al., 2015; Morris, 2024). However, inquiry based teaching is not just a single or constant approach rather, a continued instruction that could vary in terms of autonomy of student and guidance of teacher. Such features of IBT enable teachers to monitor the whole process of inquiry and meet diverse academic needs of classroom, including novice or slow learners who need temporary scaffolding and students with advance level who are capable to executing the process independently (Lazonder & Harmsen, 2016; Morris, 2024).

Science education in Pakistan

In Pakistan, it is compulsory to teach science subject to grade I to VIII (Ahmad et al., 2024). For secondary and higher secondary level education science is considered as a discipline to be chosen by students based on their interests (Altaf et al., 2023). At this stage science is classified into three more sub-subjects i.e. physics, chemistry, and biology. According to Dehraj and

Hussain (2024) curriculum wing at federal level is responsible for developing the curriculum for students while, provinces are supposed to bring it into the practice through the text books. Practices of science education in Pakistan are mostly teacher-centered (Zafar et al., 2024). It is taught as other theoretical subjects like English are taught using chalk and talk method. Students' participation is really low as they are passive receivers of knowledge (Sindhu et al., 2023). They just take classes physically not mentally. Teacher is considered authority figure here and right is answer what teacher tells (Muhammad et al., 2023).

Not only this, but science teachers also lack in content knowledge and pedagogical knowledge about how to deliver a particular lesson with a suitable strategy. In simple science teachers academic qualification does not align with the course they teaching (SPDC, 2002). Resultantly, the content of science is delivered using rote memorization.

Methodology

A type of stance that shows individuals' beliefs about the form and nature of knowledge is known as epistemological stance (Creswell & Creswell, 2017). It is a belief about in what way knowledge could be acquired and created. This influence the way researcher attempts to acquire knowledge and frame research questions. Researcher in this study have chosen interpretivist stance because the aim was to understand science teacher's perception inquiry-based teaching. Further, it helped researcher to interpret participant's response on their preparation for IBT. Epistemological stance of researcher is interpretivist because knowledge can be interpreted and can be influenced by people's believes and experiences.

Ontological stance answer your questions regarding the nature of the knowledge. There are two types of ontological stance; positivism and constructivism. Positivism can be defined as the people having this stance are of view that knowledge independent of human experiences and it is natural (Creswell, 2012). While constructivism has been defined as that knowledge is a construction of human mind and all the other things around help human in constructing the knowledge. My ontological stance is constructivism because it aligns with my epistemological stance. This stance helps researcher to explore behavior perception and experiences of people (Mohajan, 2018). This philosophical stance helps me to explore factors affecting integration of IBT in science subject.

The present study adopted qualitative study because first it align with researcher's epistemological stance which is interpretivist. Researcher being an interpretivist she has to interpret the data and qualitative methodological orientation is appropriate because it helped me unfolding and interpreting the data. Second it aligns with my ontological stance which is constructivist, researcher see her participants as they are constructing their own knowledge about cultural diversity and their preparation for CDC which is influenced by their experiences during this degree. "The qualitative approach is based on the participants rather than the researcher's explanation or choices, without holding a pre-conceived hypothesis" ((Creswell & Creswell, 2017; Creswell, 2012).

The current study employed a exploratory case study design to get an in-depth understanding of the participants' perception, their learning and preparation. In a case study researcher investigate any one or multiple cases by doing in-depth study and using different data collection tools like,

interviews, focused group discussion, observation etc. “It helped researchers in making meaning of social world they are surviving, and why things are the way they are” (Creswell & Creswell, 2017). Case study is a research design which is used to understand phenomenon in real life situations, widely used in different fields, such as psychology, sociology, political science etc.. Case study help us to explain how and why something happen (Creswell & Creswell, 2017). Rather doing statistical representation case study gives opportunity to study a phenomenon within its context to develop a deeper understanding and its relation to its context (Creswell, 2013).

The population is defined as all the people who are who are to be considered for the study at hand. All the teachers working IBA public school Larkana are population of present study. It is a strategy for selecting participants or a data collection group for the study. There are four main ways to do this, including simple random, split, organized and grouped examples (Creswell, 2012). Sampling is the process of choosing participants for the study. In present study purposive sampling techniques was utilized to select the participants. A purposive- sampling known as selective selection, judgment, and independent sample. It is the process of selecting participants, in which case the researcher's judgment is involved, while selecting the number of people to study. This approach is used in qualitative research that includes the identification and selection of a knowledgeable or knowledgeable person or groups interested in the research by Creswell (2012).

The selected sample for this study was educators who were responsible for teaching science courses at IBA Public School Larkana, Sindh, Pakistan. Purpose sampling has been adopted as a sampling method for this. A research of Creswell and Creswell (2017) states that purposeful sampling is quite helpful for the researcher who wish to comprehend, explore and get thoughts and hence must choose a group of people as a sample from which the maximum information can be gotten (Long et al., 1985). Therefore, five science teachers were selected based on their science teaching experience. The population of the study was the five science teachers present in the school.

The criteria for purposive sampling:

- The participant should be teacher at IBA Public School Larkana
- The participant should be science teacher with minimum two years of teaching experience

Data collection and analysis

The semi-structured interview guide is frequently used in qualitative research because it allows researchers to add additional questions prompted by interviewee responses, resulting in a more in- depth knowledge of the phenomena. As a consequence, a semi-structured interview has been used as a research instrument and data collecting method in the study.

A semi-structured interview is a method for gathering information from study subjects by having them discuss and listen to each other (Creswell, 2012). Interaction between two or more persons on the subject of mutual interest has been described as a form of dialogue (Creswell & Creswell, 2017). Qualitative research typically relies on semi-structured interviews since they are not

standardized. It's a one-on-one conversation between a researcher and a participant that's called an interview (Harrel, 2009). This type of interview contains a set of questions, but the interviewer is free to change the order of the questions. For this reason, the interviewer often has considerable leeway in following up on responses that are deemed relevant. As a result, semi-structured interviews were conducted to collect data for this study. Researcher was able to keep track of the dialogues thanks to semi-structured interviews. Before the interview, she produced an interview guide (Appendix II: Interview guide) to help herself and the participants stay on track. Additionally, instructors were able to speak up about the challenges they face in their communities. Qualitative research use flexible interviewing techniques like these.

According to the interview guide, participants were asked about their epistemic beliefs, including their certainty of knowing, their source of information, and their justification of knowledge, as well as about their engagement in the community and the difficulties they encountered.

Ethical Considerations

In opinion of Creswell (2012) qualitative research in the field of education totally deals with view point of a person, his/her values s/he has, and traditions he follows in everyday life, but these all could be done by making it sure that s/he following ethics of research. For maintaining sense of trust and sense of respect researcher followed specific guidelines of ethics as a result, those ethics avoided harming participants of research. Researcher briefed the participants about what is being done in study and what role they were supposed to play. She also informed them all about the research principles that they could withdraw at any stage if they feel harmed or unprotected. Keeping in mind the role of confidentiality the real names were replaced code like P1, P2, etc. It was also ensured that their personal data like name, school name, or any other thing related to their personal life not be shared with anyone other than her mentor in order to ensure security. For securing data of participants researcher arranged a personal locker where kept all records of study and saved it in her personal laptop with a secret pin that only she knows.

Limitation of the Methodology

This study is limited to a private school that's why the findings cannot be generalized, suggesting further extensive studies. In this study qualitative approach has been used and involved a small number of participants. Only semi structured interviews were used as data collection tool. Although the small sample size allowed me to present the study and gain a thorough understanding of the difficulties that trained science teachers experience when implementing IBT in secondary public schools, cross-sectional and longitudinal studies will still be necessary in future research to confirm the generalizability of the study's findings.

Findings of study

In order to respond to research questions and sub-questions of current study, this chapter discusses the findings. The results of this study have been summarized in to two major themes followed by Sub-themes. Theme one answers the first research question "What do science teachers perceive about IBT?" Theme two answers the second research question "What are the factors which affect implementation of IBT in science classroom? And how they affect implementation of IBT?" as a theme two followed by five sub-themes.

Theme 1: Science teachers' perceptions about IBT

To answer this question on what do science teachers perceive about IBT, the teachers responses were;

A teaching approach in which teacher involve students to ask questions and it motivates students for learning and helps them to understand and explore the science concepts rather than just memorizing them.

They are of the view that, IBT is an interactive teaching approach in which students ask questions which motivate them to learn the science concepts. It provides conceptual understanding rather than rote memorizing the bookish language.

It is a nice pedagogical approach which leads students to reasoning, critical thinking and problem solving skills. It is all about inquiry and to search out the things. As Socrates says, the more you ask questions, the more children will increase understanding and critical thinking – the technique of questioning helps to check students' prior knowledge and understanding.

Additionally, some teachers stated that IBT assist students to find out reasons behind causes, think critically and acquire skills to solve the problems. To show its worth, they connected it with quote of Socrates in which they said that the more students ask questions, the more they make the connections of understanding in their minds.

Students are engaged in hands on activities – experiments and group work. It is the best because every child learn by own self. Every students is engaged in it. It also touches the higher levels of learning.

Furthermore, some teachers believed that engaging students in hands on experiments or activities are the best moments and chances that IBT presents to students. They prioritize it because are of the view that it involves each student is involved higher order learning.

Theme 2: Factors which affect implementation of IBT in science classrooms

When teachers were asked about the factors which affect the implementation of IBT in science classrooms, the factors that were most commonly mentioned were fixed classroom timing, assessment criteria, limited resources, students' learning background and restrictions from the school management.

Sub-theme 01: Fixed classroom timing

A complete course schema is prepared in order to complete the course in given time. The learning goals and objectives are set by management which we have to complete within given period of time. Implementing IBT to achieve the desired goals and objectives is a time taking process. Teacher need much time to involve every student in questioning, hands on learning, experiential learning, project based learning or other classroom activities. There is also the consumption of time in transition of students from one activity to another activity. At the end of the class teacher has to assess every student's performance which is a challenging task to cover in a limited time. However, the average science class timing is forty minutes which is quite

limited. Therefore, it becomes challengeable for us to cover students' desired learning objectives in a class of forty minutes.

P4: "I have always tried to bring such strategies which are useful for students learning. I, in my initial appointment days, started teaching science using IBT but I was unable to complete the lesson on because of the fixed time of a particular period. In our school the very first two periods are of 45 minutes while other periods consist of 35 minutes and it is very challenging to complete whole lesson plan in a short period of time."

Almost All teachers argued that class duration is the most demotivating factor to implement IBT in science classroom. They reported that it is challengeable for them to engage, perform and assess students' learning in a class of forty minutes. They stated that it is easy to manage the time to teach students by lecture method rather than to engage them in inquiry based teaching approach in which it is difficult to cover desired objective in a given time.

Sub-theme 02: Lack of Learning Resources

Most of the time, I use IBT approach to implement my lesson plan but the resources are not available in this condition. When I teach chemistry, I used to consume my own resources to engage students in experiments and ask them how and why things work like this.

Another teacher argued

Having limited resources, only I perform the experiment and all the students observe me. I myself perform the experiment and give demo to the students. They are not involved in experiential learning.

Furthermore, insufficient and inadequate learning resources in school is another impediment to implement IBT in science classroom. Lack of major learning resources such as multimedia, lab equipment, internet, and computers etc. hinder teachers to engage students in real learning. Teachers buy affordable learning material by their own and use in the classrooms. Due to having limited resources in the classroom, teachers avoid to engage students in hands on learning and other activities in which there is the need of learning material. Shortage of material, teacher perform only one experiment in which the students have to observe the teacher only.

P8: "resources are very important for executing IBT in teaching because IBT is such an approach that require specific resources like scientific tools, science labs, and other material related to it. These things are expensive and our school lack appropriate funding thus, we are unable to advocate inquiry-base teaching approach."

Sub-theme 03: Assessment Criteria

In exams I have to assess students by paper pencil assessment strategy. When a student does not perform well in the exam then management blame teacher that she has not trained students well. It means I teach students in one way and assess them in other way so this twist is very difficult for teacher therefore, teachers avoid to implement IBT in the classrooms.

Another teacher stated

I am bound to assess students' performance only by using one assessment strategy. I believe that teacher should assess students as they teach them. In science, I must assess students practically not only theoretically because science is all about practical work.

Although, teachers are given several roles and responsibilities to complete the syllabus by using different teaching approaches including IBT but, they typically have no autonomy to assess students learning by applying various assessment strategies. They are only bound to assess students learning only by paper pencil method. It means, they deliver the knowledge in one way and assess it another way which is difficult for teachers to assess students' learning at real ground. It is the reason teachers avoid to implement IBT.

Sub-theme 04: Students' Learning Background

Many students come from such a learning background, where they were not engaged in Inquiry based learning or practical work and they are habitual of teacher centered approach. They think that teacher will come deliver lecture, tell the definitions of the topics and then finish the class. They actually come from such an environment in which they had never ask questions and never explore the things by themselves. Therefore, students don't get interest to learn things because they don't want to explore the things by their own.

Another obstacle on the way to implement IBT is students learning background. The students come from different backgrounds who have various learning approaches. The teachers argued that most of the students come from such background where they were not engaged in hands on learning activities nor they were involved in experiential learning. Therefore, when they are involved in students centered approach by using IBT, students resist to adopt it because in student centered approach students have to perform the tasks according to the instructions given by a teacher and here teacher act as facilitator. But students don't get interest to involve themselves. They are habitual of lecture method and they think that teacher has to teach everything and we just have to note down what teacher says.

P7: "The educational background of students is very crucial for teachers in many ways because teachers develop lesson plans aligning the academic background of students. For example there are various students whose educational experience are spent in learning with teacher centered teaching strategies. They have studied are schools where they were not engaged in Inquiry based learning or practical work and they are habitual of teacher centered approach. They think that teacher will come deliver lecture, tell the definitions of the topics and then finish the class. They actually come from such an environment in which they had never ask questions and never explore the things by themselves. Therefore, students don't get interest to learn things because they don't want to explore the things by their own."

Sub-theme 05: Restrictions from School Management

"When I implement IBT in my classroom, sometimes management resist me to do so. They are of the view that inquiry based teaching approach is just to waste time by arranging seats for group tasks, making noise when children work collaboratively, disorganization of class while performing the experiments etc. they think that learning only happens when students are sitting

on their own seats and don't make noise and are disciplined. They don't think that while performing tasks, if children make noise, change their setting arrangement or somehow they are not organized then nothing will happen because it is the part of learning. When I teach something related to plants, I take students to the garden to experience them those things practically but others think that I am wasting the time."

Making noise, disorganization, setting rearrangement or talking with each other during performing the tasks are the part of learning. This happens when students are engaged in classroom activities. But management and other teachers resist to do so. They think that these activities create disturbance not only in the classroom but in the surrounding as well. They also avoid to permit teacher to take students out of class to experience the things practically. For instance, if a teacher is teaching parts of a flower, leaf or a plant and teacher takes students to the garden to experience the flower, leaf or a tree practically, the management and other teachers assume that teacher is wasting students' time. Hence, teachers resist to apply IBT in their classrooms.

P3: "When I intend to incorporate IBT in my classroom, always my senior colleagues resist me to do so. Because they are of the view that inquiry based teaching approach is useless and a waste of time. They just say its time taking and we have to arrange seats for group tasks and create environment appropriate to the learning of students."

P5: "management restrict educators to adopt inquiry based teaching approach because they think that learning only happens when students passive and teacher is active and students are not supposed to make noise and are disciplined. Thus, in their opinion IBT is not best fit."

"They don't think that while performing tasks, if children make noise, change their setting arrangement or somehow they are not organized then nothing will happen because it is the part of learning. When I teach something related to plants, I take students to the garden to experience them those things practically but others think that I am wasting the time."

Discussion

A number of studies has been done to explore the significance of IBT implementation and its advantages to students' involvement, motivation, understanding and achievement (Furtak et al., 2012). Those studies have been conducted in different context other than Pakistan. The present study aimed to take data from Pakistani context especially from urban areas of interior Sindh where literacy rate is low and out of school children ratio is high, the problems like lack of resources, funding, and support of higher authorities are common. Thus, this study had three major objectives. Firstly, it aimed to explore the views of science teachers (teaching science subjects) about inquiry-based teaching (IBT) and to identify and explore triggering factors that affect successful implementation of inquiry-based teaching in science classrooms. However, the present study, using semi-structured interviews focusing in-depth perceptions of science teachers, disclosed similar findings perceptions of science teachers.

This study has discussed the perceptions of teachers about IBT and factors that hinder the successful implementation of IBT in science classroom. The participants shared same insights and perceptions about IBT and the way it is used in the science classrooms. In addition, most of

the participants reported that their role in the implementation of IBT is as a facilitator or coach who motivate and involve learners in problem solving tasks by doing hands on activities or performing experiments based on real situations. It is supported by the concepts of constructivists' theories which gave the base of learner centered approach, like Piaget (1972) and Vygotsky (1978), who said that a teacher plays the role of a facilitator or guide. This will give students the chance to build new knowledge using their prior experiences.

Additionally, the participants think students are engaged in hands on activities – experiments and group work. It is the best because every child learn by own self. Undoubtedly, the science is such a subject that could not be learned without putting oneself into observation and experimentation. Every students is engaged in experiment and observe the procedure of a particular science concept. By doing so students will empowered to reach the higher levels of learning. This can be aligned with the study of Loesing (2014) who states that learners make their own knowledge and explore ideas to create meaning of new concepts when they are engaged in hands on experiments. It was further added in it that inquiry-based teaching is a teaching method that is widely accepted for enhancing students' cognitive skills and reasoning skills. Moreover, IBT also enhances the motivation of students to study science subject because it involves them into the interactive learning activities.

Furthermore, teachers think that fixed classroom timing remained another restriction because in public schools there is issue of having a specific time for a single period like a period is of 30 to 45 minutes. But it is very hard for teacher to teach a science concept in such a short time period. In this regard one of the study in literature showed that inquiry-based teaching is an effective teaching method for teaching subjects like science but requires time for its successful implementation (Furtak et al., 2012). It was also disclosed in this study that inquiry-based teaching is time consuming because it enable students to observe the process and do the experiment. Therefore, teachers should be given sufficient time to execute it.

Lack of resources found be another barrier for executing inquiry-based teaching in science classroom because there were lack of resources like human and technical resources. It was discovered that there are technical resources like science laboratories and equipment but there are not working condition. The current study showed there is no any separate person who is responsible to manage the scientific tools and their repairing so that those could be incorporated in teaching when needed. From the viewpoints of respondents resources also included the financial resources which are also important for managing the scientific tools because these tools are expensive and very hard to found in market. Literature also have showed similar findings of study conducted by Kalhoro et al. (2026) that inquiry-based teaching very useful for enhancing academic performance of youngsters in science subject but it requires environment and suitable place where students surround themselves by scientific gadgets. In simple Kalhoro et al. (2026) mentioned that there should resources both human and technical resources. Human in terms of laboratories assistant who could manage all the scientific tools in science lab while, technical resources refers to the scientific tools that could be utilized to learn science.

Assessment criteria has found to be restrictions for incorporating inquiry-based teaching because teachers are asked to employ any of the teaching method but the assessment of students will be conducted only by pen paper method. While it was mentioned by respondents that it impossible to measure the performance of students by teacher centered assessment on the contrary they

learned the concept through student centered method. Al-Naqbi (2010) have noted that teacher who use inquiry based learning could get 100 percent satisfactory results from students when he/she will adopt students assessment strategies aligned with inquiry-based teaching. Educators would not get appropriate results if they do not assessment aligning their teaching strategies.

Students learning background and restrictions from management are main factors that inhibit their abilities to implement IBT in science classroom. A science class of forty minutes resist teachers to implement IBT in the classroom because teacher can achieve only one or two learning objectives resultantly, teacher cannot complete course in a given period of time. It is aligned with findings of a research by Al-Naqbi (2010) who found that the limited timing of for classroom science teaching is hindrance for teacher to implement IBT. The unavailability of enough resources to engage students in real learning also affect the ability of teachers to implement IBT. A teacher reported that it is very difficult for schools to provide investigative lessons in science subject because of lack of funding to purchase laboratory equipments and other learning material (Deterding et al., 2011). Another factor is assessment criteria. Some teachers argue that they have to teach in one way and have to assess students' performance in other way. They are bound to assess learners only by paper pencil strategy. According to Wahbeh & Abd-El-Khalick (2014) assessment strategies in schools seem to inhabit teachers' capabilities to implement IBT because they are still support national test standards which follow the traditional methods to assess students' science concepts. Finally, the other important factors that resist teachers to implement IBT are students' learning background and some restrictions from management have been highlighted.

Conclusion and Recommendations

In order to explore the factors affecting the implementation of inquiry based teaching in science classrooms, a number of studies has been done in different context. In Pakistan, very few studies have been done on inquiry based teaching. The present study had two major objectives. Firstly, it aimed to explore the views of science teachers (teaching science subjects) about inquiry-based teaching (IBT) and to identify and explore triggering factors that affect successful implementation of inquiry-based teaching in science classrooms. However, the present study disclosed similar findings by having focused the in-depth perceptions of science teachers using semi-structured interviews.

The findings of current study showed that there are five common factors affecting the implementation of IBT in science classrooms. Other than these factors there were also numerous other factors which were indirectly affected the execution process of inquiry-based teaching in science classroom. Among those five factors fixed classroom timing, lack of resources and some restrictions from the management were seen as common and strong factors which resist the implementation of IBT in science classroom. These common factors have direct impact on teachers to implement IBT, because these factors are considered as the major components in teaching and learning process. Among these factors, lack of learning resources has been revealed as the strongest factor because the implementation of inquiry based teaching in science classrooms is directly linked with the use of resources in the science activities. Inquiry-based teaching is considered as effective teaching strategy for teaching science or conceptual subjects and requires specific resources like science laboratories, scientific tools i.e. micrometer screw gauge, and students centered learning environment. However, if a teacher is able to arrange such

resources with the support of school management then inquiry-based teaching is best fit for him/her.

As teachers involve student's hands on activities, experiential learning and project based learning in inquiry based teaching therefore, the presence of resources in the classrooms is the need of inquiry based teaching strategy. Without the resources, it is very challengeable for teacher to engage students in inquiry based learning process. However, assessment criteria and students' learning background have also been highlighted as factors which hinder the implementation of IBT in science classroom. In general, assessment criteria in teaching science has been emphasized because it has negative impact on students' learning. Teaching in one way and assessing in other way do not satisfy teachers regarding students' learning. On other hand, assessment standards or criterion based assessment has been emphasized in the curriculum. But there is need of training programs that improves the assessment skills of teachers so that they could bring those skill into their teaching process. In last, Finding reveals that teachers have to manage these factors in order to implement IBT effectively.

Based on the findings of current study, some suggestions can be made for upcoming research and classroom implementation. This study recommends school administrators to minimize the factors highlighted in this study to assist teachers in implementing IBT in science classrooms. It suggests that teachers should find alternatives against these factors to avoid them rather than to leave the practice of IBT. Future researchers should conduct an in-depth study how to reduce these factors so that teacher can easily practice IBT in their classrooms. Utilizing the findings of the current study, further qualitative and quantitative data collection tools and data analysis can be done to explore the relationship between successful implementation of inquiry based teaching (IBT) and various factors such as resources, teachers' experience, curriculum or school type (public or private). As there has been very little research done in this area thus far, additional study would be highly relevant, especially in the context of Sindh.

The results of present study showed that there is a positive impact of inquiry-based teaching strategy when teaching science. The findings of Hung et al. (2008) are similar to it. Their study disclosed that inquiry-based teaching positively influences the academic performance of students. Inquiry-based teaching is powerful tool for enhancing the critical thinking and problem solving skills of learners (Bakhru & Mehta, 2020). The results of present study shown in the table number 01 show that before the intervention of inquiry-based teaching strategy students' performance were below the average of 4. But after intervention students showed high performance in Science subject. However, it clear that inquiry-based teaching method is positively influencing the performance of learners. The present study recommended that higher authorities should emphasize the integration of inquiry-based teaching. The authorities whether school level or high authorities so called school stakeholders need to take immediate precautionary measures so that the learning of students need not to be put in risk. Because science nowadays could not be taught with traditional methods rather inquiry-based teaching method is highly recommended by present study as well as other concerned studies.

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