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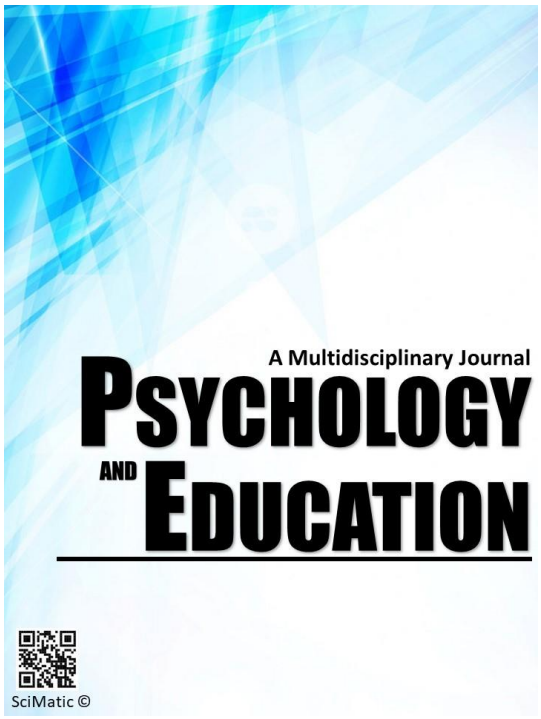

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Research Article

The Lived Experiences of Junior High School Science Teachers Amidst the COVID-19 Pandemic: An Inquiry-Based Learning

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Abstract

Numerous dimensions of our social and economic lives have undergone unthinkable transformation as a result of the global COVID-19 pandemic. This study was conducted to investigate and determine the lived experiences of junior high school science teachers amidst the COVID-19 pandemic in the context of based learning inquiry. The participants in the study were the ten junior high school science teachers at the chosen schools, five of whom taught in public schools and five of whom taught in private schools. The study's active participants were all seasoned educators with a combined teaching experience ranging from 5 to 30 years in the science premise. Semi-structured interviews were used for the data collection process. The authors consulted literature and sought advice from experts as they created the interview questions. The researchers began by transcribing every interview's audio recording. The interview data was examined using a thematic analysis process, which was aided by the initial coding of the interview transcripts, the identification of preliminary categories, the second round of coding, the refinement of categories, and the identification of emergent themes. Based on the data findings, during the pandemic, teachers claimed they were unable to teach science via inquiry for a variety of other reasons. Teachers claimed that greater preparation time was necessary for creating effective inquiry-based online lessons and traditional learning. They said that not teaching science through inquiry was due to a lack of preparation time and shorter class periods.

Keywords: *experiences, themes, science teachers, inquiry-based learning, conceptual*

Introduction

The global COVID-19 pandemic has irrevocably altered several facets of our social and economic existence. Education is one industry that has mostly escaped the pandemic's effects. Despite potential scaled-up vaccination administration and production, the future of education is still uncertain. Although many schools have adjusted to the new normal, little is known about how it has affected teaching methods and student learning. Due to the epidemic, officials are becoming interested in and pushing for instructors to deliver their lessons online. Some nations and environments mandate that teachers conduct their lessons online.

The Philippines' higher education system has undergone significant transformation as a result of the Coronavirus Disease 2019 (COVID-19) pandemic, including a notable shift in online instruction to stop the virus's spread. Because a sizable portion of the population has erratic internet access and few electronic devices, this abrupt shift to online instruction worried many teachers and pupils (Pastor, 2020; Mirandilla-Santos, 2016). Since the start of the pandemic, worries have lingered about whether an internet connection would be insufficient to sustain online schooling. These worries do not appear to be going away anytime soon. At universities in the Philippines, first- and second-year undergraduate Chemical Engineering students are obliged to study Analytical Chemistry and Physical Chemistry 1 courses. Students majoring in Chemical Engineering will cover topics including phase equilibria, laws of thermodynamics, and gas characteristics in Physical Chemistry I. Topics in chemical equilibrium, traditional quantitative analysis, and instrumental techniques analysis are covered in the analytical chemistry course.

Technology can help students learn science in a variety of ways, including by making the microscopic components of scientific concepts visible to them, by assisting them in modeling the structure and behavior of scientific concepts and procedures, by providing interactive domain-related applications (such as online laboratories), and by providing tools that encourage effective student engagement with data, models, and other students (Edelson, Gordin, & Pea, 1999; Feldman & Capobianco, 2008; Linn, Freda, Husic, Slota, & Tinker, 2006). The Web-based Inquiry Science Environment (WISE) curriculum, PHET simulations, and the GoLab learning ecosystems are a few examples of these technologies and tools.

These technological ecosystems and technology-based curricula have been developed to allow teachers to accept and support students' technological learning of science concepts and procedures. Because these technology ecosystems are so content-rich and focus on many areas of inquiry, including hypothesis

creation, data gathering, organization, and analysis, it is assumed that students will naturally pick up on science principles and practices. However, creating and implementing online or digital learning materials is a difficult challenge for teachers who lack pedagogical resources to create lessons for online instruction, limited expertise creating digital materials, and no formal training in online teaching. Science instruction in an online learning environment is particularly challenging for STEM teachers who are used to giving hands-on inquiry-based learning activities in person (Cober, Tan, Slotta, So, & Könings, 2015; Varma, Husic, & Linn, 2008).

The nation's first schools closed in the spring of 2020 (Reich et al., 2020). The COVID-19 issue prompted several changes to daily life, which added stress to everyone's lives and needed changes in the teaching and learning process as well. As schools were closed in all 50 states, each one developed its own set of regulations with varying emphasis. State departments of education chose to encourage teachers to concentrate on either the presentation of new academic material or on review and enrichment activities in their recommendations for distant learning in order to advance academic success (Reich et al., 2020). Additionally, school districts across the nation were obligated to continue providing meals to children of eligible families and to set up daycare for emergency, medical, and other crucial staff in every neighborhood (Summary of Child Care Provisions of the Coronavirus Aid, Relief, and Economic Security Act or "CARES Act," 2020).

Deep conceptual knowledge and the acquisition of fundamental scientific and engineering abilities are thought to be driven in part by students' meaningful participation in their education (Beymer, Rosenberg, & Schmidt, 2020). Different instructional strategies, such as problem-based learning, inquiry-based learning, collaborative learning, modeling, and argumentation, can result in students' active participation in the learning process (Ainley, 2006; Ben-Eliyahu, Moore, Dorph, & Schunn, 2018). The cornerstone of the argument for reforming science education is inquiry-based learning, which motivates students (Bansal & Ramnarain, 2021; Nhlengethwa, Govender & Sibanda, 2021).

The obstacles to schooling were enormous, and neither the federal government nor the states provided much support. Obstacles became quite clear when all districts adopted some type of online, remote, or virtual learning. Differences in access to and proficiency with technology have emerged (Cullinane & Montacute, 2020). Academic advancement was frequently substituted with a focus on pupils' emotional and physical well-being. In reaction to the pandemic, educators across the nation changed the curriculum, how it was delivered, and how it was assessed (Chabbott & Sinclair, 2020; Viner et al., 2020). The crisis's pressure and urgency forced them to act in this way. They accomplished so without any training or prior experience.

In the literature on science education reform, inquiry-based learning is defined as learning experiences in which students make detailed observations, organize, and carry out scientific investigations, pose research questions, analyze data, and create scientific hypotheses (Driver, Newton, & Osborne, 2000; National Research Council [NRC], 1996; 2000). However, inquiry-based learning for most teachers refers to pupils conducting scientific experiments in actual laboratories. The foundation of inquiry-based learning in science classrooms is the practical laboratory experiences. The pandemic, however, has prevented this kind of instruction and learning. Instead, educators are required to create similar learning opportunities in online learning environments (de Jong et al., 2020). Additionally, without the proper training, they have been asked to mimic inquiry in online learning environments.

The ultimate objective of a successful science teacher is to create online learning tasks that foster students' curiosity, guarantee their effective engagement with the subject matter and with one another, keep them motivated to put in cognitive effort while learning, and lead to the acquisition of deep conceptual knowledge and scientific inquiry skills (de Jong et al., 2020). Only until online learning activities can be successfully created and scaffolded by the teacher will they have true educational value. For instance, creating instructional designs requires various types of expertise, including TPCK (technological, pedagogical, and content knowledge) ([Technological Pedagogical Content Knowledge] Mishra & Koehler, 2006). However, many teachers lack the TPCK required for creating or successfully utilizing inquiry-based learning activities (de Jong et al., 2020; Yan, Chai, & So, 2018). Therefore, they require assistance in adapting the designers' abstract theoretical presumptions about the objectives and benefits of these technology ecosystems to their lesson plans. When we refer to technology systems, we are referring to online learning environments like GOLABZ, WISE, and PHET simulations that give students the chance to engage in science learning through inquiry.

Teachers' belief systems towards teaching and learning, their subject-matter expertise, and their pedagogical technical expertise all have a significant impact on how they create engaging and effective learning experiences. Teachers who seek to use inquiry-based teaching confront additional hurdles in nations or parts of nations where students lack the technology means to participate in the planned learning activities and complete assignments. For instance, a recent poll found that the participation rate for pupils in rural Turkey, particularly those in the east, remained below 50% (Egitim-Sen, 2021). Additionally, individuals who could access the course materials experienced numerous disruptions because of faulty network problems (Egitim-Sen, 2021). Similar differences exist between how well-established private schools prepare their instructors and provide them with the resources they need to teach science via inquiry and how public schools do these things. The disparities in teacher in-service training between public and private schools, theoretical presumptions about what effective online teaching should entail, and the difficulties associated with student engagement in online learning highlight the necessity and significance of scrutinizing science teachers' instructional methods. In this study, we investigate how six Turkish primary school science instructors have created and led online inquiry-based learning activities.

As learning facilitators, teachers create an engaging learning environment that inspires students' intellectual curiosity and learning motivation. They also assist students in developing learning goals, offer a framework for them to engage in intellectual activities, formulate inquiry questions, design their investigations, and offer support to them as they carry out their investigations (Bansal & Ramnarain, 2021; NRC, 1996; NRC, 2000; Wirkala & Kuhn, 2011).

The most fundamental type of inquiry used in the classroom is structured inquiry. Students participate in learning by simply adhering to teacher instructions in structured inquiry-based learning contexts (Abrams et al., 2008; NRC, 1996). The teacher gives the research question, explains the steps students should take in their investigations in a specified order, provides a structure for gathering and organizing data, and provides a format for writing the findings of the students' investigations. Students do not have any control over the question or the investigative process in this type of inquiry. As a result, the students' participation in the inquiry experience is not very intellectually stimulating. In guided inquiry, the teacher works with the students to create their research questions and investigation plans. The teacher either provides questions for the student to choose from, or they work with the student to create their own investigative inquiries (Abrams et al., 2008; NRC, 2000; NRC, 2013). Through continuing scaffolding, the teacher helps the student or group of students construct their research. Students are given a data table template along with instructions on how to gather and evaluate specific data. Finally, using a template or series of questions provided by the teacher, the student is assisted in forming conclusions and explanations from their findings. Open inquiry can be described as a student-centered approach that starts with a student formulating an investigable research question based on his or her interests, then designing and carrying out an investigation or experiment, analyzing data, and sharing findings with the learning community through models, evidence-based explanations, and defending the findings through persuasive arguments (NRC, 1996; NRC, 2013; Windschitl, 2003). The key to open inquiry is allowing students to formulate the questions that direct their own inquiries and giving them the freedom to construct their own investigations.

This type of education is the most advanced since it most nearly resembles the science that is conducted in real laboratories. As they plan, carry out, and present the findings of their studies, students take part in the epistemic and social practices of science. This paradigm made it easier for us to evaluate and interpret the instructional strategies used by teachers and the caliber of the inquiry-based learning opportunities they gave their pupils.

Research Objectives

This study was conducted to investigate and determine the lived experiences of junior high school science teachers amidst the COVID-19 pandemic in the context of based learning inquiry. Specifically, this study was administered to accomplish the following objectives:

1. To identify and evaluate junior high school science teachers who adapt their inquiry-based teaching during the COVID-19 pandemic; and
2. To determine the challenges that they have encountered during the implementation of inquiry-based teaching and learning.

Methodology

Research Design

Cresswell (2007) defined research as the investigation of a problem through one or more cases inside a constrained system. The researchers set out to investigate 10 junior high school science teachers who used inquiry-based instruction or teaching during the COVID-19 epidemic. The teachers were chosen based on their track record of inquisitive science education. The number of teachers and the teaching during the pandemic set the context's boundaries. The current study was a multi-case study (Merriam, 1998) in order to better understand how junior high school science teachers used inquiry-based strategies during the COVID-19 epidemic.

Participants of the Study

Participants in the study were the ten junior high school science teachers at the chosen schools, five of whom taught in public schools and five of whom taught in private schools. The study's active participants were all seasoned educators with a combined teaching experience ranging from 5 to 30 years in the science premise. All of them are currently using platforms offered by the schools themselves to teach both online and in-person. The teachers were all enthusiastic to teach science through inquiry. They all affirmed their commitment to using inquiry-based instruction to teach science. Before the epidemic, all the participants claimed to have taken part in face-to-face professional development courses in STEM and inquiry-based instruction.

Data Analysis

Semi-structured interviews were used for the data collection process. The authors consulted literature and sought advice from experts as they created the interview questions. Most of the interview questions were developed using the authors' prior research, which was published and focused on developing a scientific inquiry scale that was compatible with the NSES framework (NRC, 1996). Writing interview questions, receiving expert comments, and piloting these questions through a face-to-face series of brief interviews were all steps in the development of the questionnaire items. The interview questions were then revised as part of the procedure.

Prior to revision and finalization, these updated interview questions were piloted. The open-ended questions covered the following topics: objectives for teaching science; descriptions of inquiry-based instruction; descriptions of inquiry-based instruction delivered online; strategies for adapting inquiry-based instruction during the pandemic; adaptation of assessment strategies; and the difficulties they have encountered in their teaching during the pandemic. To be transcribed, all interviews were audio recorded. The researchers began by transcribing every interview's audio recording.

During the study's writing phase, the translation of the interview transcript was completed in the participating schools. Writing reflective notes, preparing summary sheets, developing patterns and themes, connecting categories, and making contrasts and comparisons were all used as analysis techniques (Miles & Huberman, 1994). The first and third authors of the current study conducted the interview analysis. Re-analyzing the raw data and categorical modification were used to reconcile discrepancies in interpretations until agreement was established (Patton, 2002). Additionally, the second author independently coded the four study participants, and there was a 95% agreement in the coding (Creswell, 2007).

The research was conducted with the highest ethical standards. The researchers looked at the concepts and ideas of the authors in order to avoid plagiarism, and they honored their rights by properly attributing them. Furthermore, in order to conduct the study with the respondents, the researchers developed a request form. The confidentiality of the respondents' data and the data to be collected is also considered throughout the investigation. The researchers also remove the data they have gathered from their end after the study is over and the results are in.

Results and Discussion

This study explores the inquiry-based teaching experience of 10 in-service junior high school science teachers during the COVID-19 pandemic. The main aim of the study was to explore how the COVID-19 pandemic influenced elementary science teachers' inquiry-based teaching goals, their implementation of inquiry-based teaching, and how and to what extent their teaching goals and practice related to inquiry shifted during the pandemic.

The interview data was examined using a thematic analysis process, which was aided by the initial coding of the interview transcripts, the identification of preliminary categories, the second round of coding, the refinement of categories, and the identification of

emergent themes. Through an iterative process of coding and categorizing, major patterns were discovered, leading to the most important subjects in participants' answers to the interview questions. These themes developed from the transcript data when they were examined in relation to the study questions, and they were found inductively and bottom-up. This led to the final distribution of themes that were thought to best capture the research participants' stated experiences.

It specifically addressed the following objectives: (1) To identify and evaluate junior high school science teachers who adapt their inquiry-based teaching during the COVID-19 pandemic; and (2) To determine the challenges that they have encountered during the implementation of inquiry-based teaching and learning. This section will also discuss the relevance and interpretation of the results that follow.

Theme 1: Conceptual Difficulties and Challenges in Inquiry-Based Scientific Education Faced by Junior High School Science Teachers

The researchers looked at teachers' perceptions of teaching science, the meaning of inquiry-based instruction, and how the epidemic had changed these perceptions and objectives. The study's participants asserted that they used inquiry-based education in their daily activities. The researchers asked them to describe the main objectives of science teaching in general and if their objectives have been modified as a result of the COVID-19 pandemic in order to understand how their practices of inquiry-based teaching are compatible with the actual inquiry-based teaching framework promoted in documents on science education reform. As was to be predicted, all the junior high school science teachers cited the development of scientifically educated citizens as their primary objective in teaching science. The participants mainly concentrated on students' meaningful comprehension of natural phenomena and students' exploration of the concepts; developing students' naturalist curiosity; acquiring science process skills; and applying scientific information to everyday situations encountered.

Science Teacher 2 stated that,
"As a teacher itself, the goal of teaching in public schools is to develop individuals who can make science-informed reform decisions in the context of education. As a teacher and facilitator of learning, I want to make science learning experiences of my students very meaningful and interesting, where they can learn and explore a lot about the environment and the situation of the world. Also, I want to instill in their minds that learning science means knowing the concepts of life based on curiosity and inquisitive thinking."

Science Teacher 5 stated that,
"As a private teacher and teaching science subjects, I realized that teaching my students the basic concepts of science means that you are helping them to look for the beauty of life. Science provides advancements like in education. We are learning more because of science and its advantages. In an inquiry and scientifically based instruction reform, I simply want to emphasize to my students the importance of knowing science. Hence, providing interactive activities in science would explicitly adhere to the importance of the subject matter."

Science Teacher 7 stated that,
"The main objective of science education is to understand nature, so I want my students to follow their curiosity and explore nature using methods and means of science. My main goals are to increase students' curiosity towards nature, give them a sense of joy through discovery, and help them to develop scientific observations and questioning skills."

Although most participants did not offer lengthy responses, all of them attempted to assist students understand natural phenomena using scientific methods and to prepare informed, scientifically literate citizens. One long-standing objective of science education reform initiatives has been to implement scientific inquiry in science classrooms beginning in elementary school (NRC, 1996; 2000; 2013; Schwab, 1960). Since the 1996 release of the National Science Education Standards, science instructors have had some degree of success (van Uum, Verhoeff, & Peeters, 2016).

While many teachers have yet to successfully apply inquiry in their classrooms (Correia & Harrison, 2020; Crawford, 2007), others of them have been able to cultivate the beliefs, knowledge, and abilities necessary to do so (Abrams, Southerland, & Evans, 2008; Blanchard, Southerland, & Granger, 2009). In this study, we looked at how the COVID-19 epidemic affected the teaching methods of these teachers. Engaging students in scientific procedures as they take place in real-world situations is one of the aims of inquiry-based learning (NRC, 2000; 2013). These skills include the capacity to make systematic observations, gather and analyze data, formulate

explanations based on scientific evidence, and convey these explanations to peers (Chinn & Malhotra, 2002; NRC, 1996; 2000). The study's findings demonstrated that teachers have aspirational aims for teaching science through inquiry and evolving attitudes of scientific inquiry.

By "developing perspectives," they mean that these educators realized that involving pupils in real-world scientific practices is the purpose of scientific research. They could list various features of inquiry, but they were unable to go into detail about specific instances of inquiry in the classroom. They struggled to create a fruitful atmosphere and efficient ways to engage their students in inquiry, while having such lofty aspirations and a growing grasp of the characteristics of inquiry-based education.

Theme 2: The Fundamental Constraints of Inquiry-Based Science Education in the Classroom

Many of the teachers said that they had not altered their goal of fostering scientific literacy in response to the pandemic's impact on science teaching objectives. To accomplish their pedagogical objectives, they stated that they modified the tools based on the online learning environment and face to face premise. In this section, they looked at how the participants transformed their inquiry-based teaching and assessment practices as well as the variables affecting their preparation, delivery, and evaluation. They first attempted to determine whether the participants had a concept of inquiry-based education that was acceptable within the context of the ongoing research.

Instead of the ideal of unfettered inquiry, they define acceptable as teachers guiding their pupils' or students' investigation. This means that training will be centered on getting students involved in scientific inquiry skills like noticing a phenomenon, carrying out experiments, and coming to conclusions through data analysis.

It was discovered that the participants' definitions of scientific inquiry and their objectives for science teaching overlapped when it came to teachers' definitions of scientific inquiry. Many participants described scientific inquiry as the investigation of scientific ideas by students through their questions, curiosities, and discoveries. This approach places students in charge of their own education and makes use of science process skills like questioning, identifying variables, controlling variables, testing, experimenting, questioning, and inferencing.

Science Teacher 1 stated that,

"The teacher's role should be limited to guiding student inquiry, not controlling student thought. Students can explore concepts on their own or with their friends, either through experiments or through brainstorming. The important thing is that they are the ones in control of their exploration and inquiry. Additionally, inquiry to me refers to students posing inquiries, planning controlled experiments, selecting, and comprehending dependent and independent variables, formulating arguments, or drawing conclusions by contrasting the advantages and disadvantages of various points of view. Only if we involve our students in all these activities, in my opinion, will we be able to match our practice with true science."

Science Teacher 9 stated that,

"The most crucial aspect of inquiry-based learning, in my opinion, is exploring answers to questions by asking the right questions, and I try to reflect this in my teaching. Consistent with this belief, I concentrate on improving their observation skills, their questioning skills, and try to help them understand the features of quality scientific research. I try to illustrate the inquiry process through practical exercises with everyday objects. While teaching, I occasionally have the idea to use various objects to help my learners understand scientific ideas and concepts. I then go get those objects. Using everyday objects as examples, I strive to teach."

Science Teacher 3 stated that,

"I include my students in hands-on activities at home because I am unable to provide them with lab-based learning opportunities. For instance, I recently had them participate in a practical assignment where they had to utilize everyday items to demonstrate to me the conservation of matter. Each student has a few minutes to describe their models and the scientific procedure they followed. We occasionally perform these tasks as a class. In the cell structure model and telescope construction projects, we did it. They merely keep pace with me as I work on the project."

"I want them to conduct experiments and provide me with photographic evidence of those experiments. I taught lab-based activities one day a week. As an instance, I recently asked them to create a model of the neurological, muscular, or respiratory systems, and share it with me."

Participants described additional strategies they use to implement inquiry-based instruction in their classrooms. Participants reported being forced to use online videos to instruct their students in science concepts and procedures due to a lack of efficient inquiry-based online teaching resources. Others are still getting used to the face-to-face teaching as they now require more time to plan out exercises that they can employ in the classroom environment.

Theme 3: Institutional and Administrative Issues with Inquiry-Based Science Education

This portion sought to examine the difficulties that the teachers faced in addition to the conceptual and procedural problems associated with inquiry-based education. Teachers were faced with problems like the administration's demands of them, difficulties with parents, and student attendance. Since many of the teachers had to expend more energy coping with these administrative issues rather than concentrating on preparation for inquiry-based teaching, the objective of teaching through inquiry-based learning diminished as a result. Time constraints, a focus on maintaining student presence in online classes, becoming accustomed to online teaching resources, a lack of student access to laboratory equipment, and the impact the COVID-19 pandemic had on their psychology and domestic responsibilities were some of the reasons why the teachers switched from inquiry-based teaching to more teacher-centered teaching instruction. For instance, one of the teachers mentioned how unmotivated students were to attend online classes when discussing students' absences. She also emphasized how some students' socioeconomic circumstances precluded them from enrolling in online classes.

Science Teacher 6 stated that,
"As a private science teacher, some of my students are unable to attend because they do not have access to the internet or a computer at home. Unfortunately, there is nothing I can do to help them. They escaped me. I struggle with attendance. There are often 37–38 students present in a class of 42. The motivation of students to attend online classes is poor. They are psychologically present on occasion, but not frequently."

During the pandemic, teachers claimed they were unable to teach science via inquiry for a variety of other reasons. Teachers claimed that greater preparation time was necessary for creating effective inquiry-based online lessons. They said that not teaching science through inquiry was due to a lack of preparation time and shorter class periods.

Science Teacher 2 stated that,
"Sometimes after carefully planning a lesson, I feel as though everything is wonderful, but the next day I get a message from the administration telling me that I need to make changes. There are many unforeseen judgments that I must make. They ask that we speed up the content coverage or take another action. It is challenging for me to plan for inquiry-based teaching since I do not feel like I have control over the lessons I teach."

These results sum up the experiences with inquiry-based teaching that ten (10) junior high school science teachers have had. The researchers go over what these findings reveal about teacher preparation and their implications for practice and policy in the next section.

Conclusion

One long-standing objective of science education reform initiatives has been to implement scientific inquiry in science classrooms beginning in elementary school to secondary school (NRC, 1996; 2000; 2013). Since the 1996 release of the National Science Education Standards, science instructors have had some degree of success (van Uum, Verhoeff, & Peeters, 2016). While many instructors and teachers have yet to successfully apply inquiry in their classrooms (Correia & Harrison, 2020; Crawford, 2007), others of them have been able to cultivate the beliefs, knowledge, and abilities necessary to do so (Abrams, Southerland, & Evans, 2008; Blanchard, Southerland, & Granger, 2009). In this study, the researchers looked at how the COVID-19 epidemic affected the teaching methods of these teachers. Engaging students in scientific procedures as they take place in real-world situations is one of the aims of inquiry-based learning (NRC, 2000; 2013). These skills include the capacity to make systematic observations, gather and analyze data, formulate explanations based on scientific evidence, and convey these explanations to peers (Chinn & Malhotra, 2002; NRC, 1996; 2000). Our study's findings demonstrated that teachers have aspirational aims for teaching science through inquiry and evolving attitudes of scientific inquiry. By "developing perspectives," they mean that these educators realized that involving learners in real-world scientific practices is the purpose of scientific research. They could list various features of inquiry, but they were unable to go into

detail about specific instances of inquiry in the classroom. They struggled to create a fruitful atmosphere and efficient ways to engage their students in inquiry, while having such lofty aspirations and a growing grasp of the characteristics of inquiry-based education.

Teachers had a simplistic grasp of the abilities associated to inquiry in terms of assessment beliefs and practices. Although teachers discussed data gathering, questioning, and performance skills, they did not move beyond these fundamental abilities. This highlights the need to support teachers in deepening their comprehension of inquiry skills and methods for evaluating them. Finally, there are frequently challenging national exams at the end of each grade band. Administrators and parents put pressure on teachers to cover the material covered in these tests.

The promotion of knowledge and abilities that are examined on the national exam takes precedence over the teaching of inquiry skills. This is merely a side issue, though. The fundamental issue is instructors' poor understanding of techniques and content in assessment connected to inquiry-based learning. Teachers, for instance, found it difficult to respond in a way that is consistent with the objectives and procedures of scientific inquiry when asked how they went about evaluating the results of inquiry-based learning. They referred to the measuring of higher-order thinking skills rather than offering specific and focused solutions, which would have allowed future research to study how instructors might be encouraged to grow their views, knowledge, and skills pertaining to inquiry-based teaching.

Teachers will never fully understand the effects of the COVID-19/Coronavirus pandemic's school closings and shift to distance learning. The best that they can hope for is to learn about and comprehend the experiences of teachers at this time. This study's conclusion is that teachers' decisions about the course content were influenced by a time restriction and delivery strategy that were placed on them, as well as by their concern for the emotional wellbeing of their students, which took precedence over academic content. Teachers also mentioned that, if they decide to stay in the field, their experiences will have an impact on how they teach in the future, both in a traditional setting and through remote learning.

When seeking to teach science through inquiry, teachers face difficulties. These difficulties have a variety of philosophical and practical issues as their causes. Teachers must participate in meaningful professional development that is contextualized in their job assignments to address these issues (Capps & Crawford, 2013). It takes teachers acquiring curriculum design abilities in addition to pedagogical knowledge and skills to teach science online. Teachers must be given ample opportunities to create and evaluate online curriculum based on the fundamentals of scientific inquiry. Due to poor process management, instructors/teachers now shoulder the duties of school counselors. Teachers now have a dilemma as a result of this. They found themselves calling parents and pupils to confirm attendance rather than spending time arranging their courses. During emergencies, workers and resources should be better coordinated.

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