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# Exploring teachers' perceptions towards dialogic teaching in primary science classrooms in Saudi Arabia

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## ABSTRACT

This purpose of this study was to investigate teachers' perceptions of the implementation of the dialogic teaching approach in primary science classrooms in Saudi Arabia. Semi-structured interviews were conducted with 12 primary school science teachers to collect the qualitative data. The interviews were video recorded, and the collected data were analyzed using NVivo software. The majority of primary science teachers demonstrated positive attitudes towards the use of dialogic teaching in science lessons, citing a number of associated advantages of dialogic teaching such as supporting students' learning, attracting students' attention, creating a positive learning environment, developing students' characteristics and developing a culture of dialogue in the classroom. However, despite employing a number of dialogue activities including teacher-student dialogue, student-student dialogue, question and answer, group discussion, and teacher-led class discussion, the results indicated that the teachers tended to control the use of dialogue, due to the challenges they encounter in their teaching practice. This paper discusses the implications of six main challenges identified as hindering dialogic teaching, related to: teachers; students; schools; class sizes; the science curriculum; and lack of time. Accordingly, a number of suggestions were concluded that could address the challenges and improve the quality of the implementation of the dialogic teaching approach in Saudi schools.

**Contribution/Originality:** This study is one of very few qualitative studies to investigate primary science teachers' attitudes, implementation and challenges of the dialogic teaching approach in the Saudi context. This study shows how science teachers in primary schools in Saudi Arabia both perceive and implement dialogic teaching and how they view the challenges that hinder the implementation of dialogic teaching.

## 1. INTRODUCTION

Previous studies have acknowledged the importance of employing science teaching practices that are conducive to a positive learning environment capable of supporting students' engagement and learning (Gillies, 2020; Mortimer & Scott, 2003; Smart & Marshall, 2013). The dialogic teaching practice particularly has recently been acknowledged as an important field of educational research in primary science classrooms (Gillies, 2020; Kumpulainen & Rajala, 2017; Muhonen, Rasku-Puttonen, Pakarinen, Poikkeus, & Lerkkanen, 2017; Tytler & Aranda, 2015), with the main focus being on dialogic interaction between teachers and students (Scott & Ametller, 2007).

Most previous studies (e.g., (Clarke, Howley, Resnick, & Rosé, 2016; Lehesvuori, Viiri, & Rasku-Puttonen, 2011; Mercer, Dawes, & Staarman, 2009; Scott & Ametller, 2007)) examined the use of dialogue for teaching science in the context of Western countries, including in relation to the relevant culture and educational techniques. However, more research is needed into the use of the dialogic teaching approach in different cultures and contexts, with only a small number of studies having explored this issue in relation to Saudi culture in particular, mainly by studying the use of dialogue in universities (Bawazeer, 2014; Zayed, 2016) and when teaching English (Alanazi & Widin, 2018; Almutrafi, 2020; Hamdan & Elandeef, 2021). The main objective of this current study is to investigate the participants' perceptions of the implementation of the dialogic teaching approach in science classrooms in Saudi Arabian primary schools.

## 2. THEORETICAL FRAMEWORK

### 2.1. Dialogic Teaching

The theoretical framework for dialogic teaching was initially introduced by Alexander (2017), who focused on the characteristics of the interaction between teachers and students in a classroom. Alexander's (2017) framework was heavily influenced by the works of Vygotsky (1962); Bakhtin (1981) and Bruner (1983), which present language as an important cultural tool for mediating social interaction, thought, and understanding. In addition, Alexander (2017) considered the talk as an essential tool for effective teaching and "arguably the true foundation of learning", asserting that spoken language is a significant tool to promote the dialogic teaching approach within the classroom. The term 'dialogic' has been associated with several approaches to classroom dialogue, including inquiry, exploratory talk, questioning and argumentation (Chin, 2006; Gillies, 2020; Kerawalla, 2015; Lehesvuori et al., 2017). Furthermore, Alexander (2020) considered it an "interactive form, with function implicit, dialogue may be defined as: conversation, discussion, deliberation [and] argumentation". Elsewhere, Lyle (2008) contrasted dialogic teaching with monologic talk, in which the teacher acts as a transmitter dominating classroom talk.

Dialogic teaching can be described as a method that involves "harness[ing] the power of talk to stimulate and extend students' thinking and advance their learning and understanding" (Alexander, 2017). This necessitates both teacher-student and student-student interactions. According to Alexander (2017), there are five strategies that can be implemented to organize students' interactions in the classroom: firstly, whole class teaching; secondly, teacher-led group work; thirdly, student-led group work; fourthly, teacher-student interaction; and fifthly, student-student interaction. These strategies can assist teachers to plan classroom dialogue and formulate interactive contexts. Moreover, Flitton and Warwick (2013) stated that use of dialogue in the classrooms helps to develop students' understanding and knowledge-building collaboratively. Therefore, Alexander (2017) referred to the five fundamental features of dialogic teaching as follows:

1. Collective: teachers and children address learning tasks together, whether as a group or as a class, rather than in isolation.
2. Reciprocal: teachers and children listen to each other, share ideas and consider alternative viewpoints.
3. Supportive: children articulate their ideas freely, without fear of embarrassment over 'wrong' answers; and they help each other to reach common understandings.
4. Cumulative: teachers and children build on their own and each other's ideas and chain them into coherent lines of thinking and enquiry.
5. Purposeful: teachers plan and facilitate dialogic teaching with particular educational goals in view (p.28).

Wells and Arauz (2006) and Klara Sedova, Sedlacek, and Svaricek (2016) stated that the role of the teacher in classroom dialogue is as a manager or facilitator to increase students' talk and interaction. According to Alexander (2017), teachers are required to employ several approaches for organising students' interactions and engaging in

dialogue, including whole class teaching, teacher-student interaction and student-student interaction. Alexander (2017) also noted that teachers may use discussion in the form of "the exchange of ideas with a view to sharing information and solving problem" and dialogue to achieve "common understanding through structured and cumulative questioning and discussion". These strategies may help teachers to plan the classroom dialogue and to develop interactive contexts.

## 3. LITERATURE REVIEW

### 3.1. Dialogic Teaching in Science

Many previous studies have advocated the use of dialogue in science teaching, both to support students' learning and develop their thinking skills (Chin, 2006; Mercer et al., 2009; Scott, Mortimer, & Aguiar, 2006). Lehesvuori et al. (2011) considered the dialogic teaching approach an important factor in both learning and teaching science, particularly as it enhances scientific knowledge through the use of critical reflection and dialogue. Moreover, Mercer et al. (2009) stated that as the use of dialogue in teaching science offers additional opportunities for talk, it tends to promote both engagement and motivation. Previous studies have indicated that, in developed nations, most science teachers demonstrate a positive attitude towards the use of dialogic teaching in science lessons (Lehesvuori et al., 2011; Mercer et al., 2009; Tytler & Aranda, 2015). Additionally, Mercer et al. (2009) noted the importance of science teachers in helping students to understand science lessons and ensuring they understood the dialogic processes employed. Scott and Ametller (2007) opined that meaningful learning in science involves teachers creating space for dialogic discussion prior to introducing and concluding discussions with the authoritative voice of science. Indeed, a number of studies indicated that a combination of authoritative and dialogic approach can prove most beneficial for students' learning outcomes (Furtak & Shavelson, 2009; Gillies, 2020; Scott & Ametller, 2007). Thus, use of dialogic teaching in science lessons helps attract students' attention and confidence, increases their level of their engagement, and encourages them to express their opinions and contribute to discussions (Clarke et al., 2016; Gillies, 2013; Kerawalla, 2015; Kumpulainen & Rajala, 2017; Lehesvuori et al., 2017).

### 3.2. The Role of the Teacher and Students in the Dialogue

Teachers and students generally play a critical role in promoting dialogue in the teaching and learning process (Gillies, 2020; Kim & Wilkinson, 2019). The main role of the teacher in dialogic teaching is to be a manager, a facilitator, and to provide opportunities for students to interact, engage, and contribute to the dialogue and discussion (Sedova et al., 2016; Webb & Ing, 2019; Wells & Arauz, 2006). The teacher creates a safe class environment for meaningful learning that encourages students' interaction and collaborative reasoning (Knight, 2020; Sami Lehesvuori, Ratinen, Moate, & Viiri, 2018). Attracting students' attention is also considered one of the important roles of the teacher in educational dialogue (Muhonen et al., 2017).

Science teachers play a critical role in engaging students and facilitating effective classroom dialogue to promote students' critical thinking, problem solving skills and brainstorming of ideas, as well as enhancing their understanding in a collaborative manner (Smart & Marshall, 2013; Webb & Ing, 2019; Wells & Arauz, 2006). In addition, science teachers play an important role in establishing a positive and respectful classroom environment, so providing opportunities for the acquisition of scientific concepts (Gillies, 2013; Kumpulainen & Rajala, 2017). In response, students in science classrooms can be involved in constructing meaning, thinking and interacting with others and developing their scientific opinions (Mercer et al., 2009; Scott et al., 2006).

Students play a vital role in dialogic teaching because they are the focus of the educational process (Mercer & Littleton, 2007). According to Lyle (2008), the classroom dialogue enables students "to play an active role in developing a personally constructed understanding of the curriculum through dialogic interchange". Additionally, students help each other to learn, participate to reach common understanding, and then express thoughts freely without any fears (Alexander, 2017). Moreover, students can challenge each other's ideas and collaborate with others

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to solve problems and co-create knowledge (Gillies, 2020; Scott et al., 2006). A major role is played by students during dialogic teaching, as student discussion involves the sharing of prior knowledge and experience (Mercer & Littleton, 2007). Furthermore, as argued by Alexander (2017), students are required to respect each other and listen carefully when they interact with their peers. It may be important for students to both ask questions and respond to the teacher's or peers' questions to allow the dialogue to continue (Alexander, 2017; Mercer et al., 2009).

### 3.3. Challenges of Dialogic Teaching

Despite the benefits that dialogic teaching presents, the process of implementing a productive dialogic teaching approach is not an easy task; it requires more than simply understanding its benefits and how it should be applied. Indeed, the successful implementation of dialogic teaching may be inhibited due to several social, cultural, and pedagogical factors. This study will consider the major challenges related to the teacher, the students, the science curriculum, the lack of time, and the number of students. The most significant potential challenges inhibiting the successful implementation of a dialogic teaching approach are the teacher's content knowledge and their understanding of how to implement dialogic teaching effectively (Alfayez & Alshammari, 2017; Lehesvuori et al., 2011; Ruthven et al., 2017).

Further challenges that may prevent teachers from employing dialogic teaching are related to students' discipline and behaviour. Lehesvuori et al. (2011) referred to disciplinary problems as one of the main issues that concern teachers during use of the dialogic approach. Furthermore, Uçak and Bağ (2018) reported that issues regarding students' discipline, such as disrespecting others' opinions and interrupting others, make the dialogic approach difficult to use, particularly with a crowded classroom. This crowding can also prevent some students from participating.

Another major factor that may hinder teachers from implementing dialogic teaching is the limitation of time. Research has indicated that the implementation of dialogic teaching consumes a significant amount of time because the teacher and students need a sufficient period to discuss and listen to each other's opinions through several activities to achieve the objectives of the lesson (Bansal, 2018; Chin, 2006; Lehesvuori et al., 2011; Scott & Ametller, 2007; Scott et al., 2006; Uçak & Bağ, 2018). Additionally, an over-crowded curriculum is considered another fundamental challenge that prevents teachers from implementing dialogic teaching (Bansal, 2018; Chin, 2006; Lefstein, 2010; Sedova, Salamounova, & Svaricek, 2014). This issue is linked with the question of limited time in that teachers may find it challenging to cover the national curriculum, particularly with the science curriculum (Bansal, 2018; Chin, 2006). Moreover, the number of students in each class can be a barrier to the implementation of dialogic teaching. With a large number of students, science teachers can find it difficult to provide opportunities for every student to participate (Alabdulkareem, 2017; Bansal, 2018; Chin, 2006; Uçak & Bağ, 2018).

## 4. CONTEXT OF STUDY

This study was conducted in Saudi Arabia, where general education is free, falling under the governance and adhering to policies set out by the Ministry of Education. Students in Saudi primary schools, study various subjects including science, each of which has a pre-set curriculum. In recent years, the science curriculum has adopted teaching methods based on the constructivist theory of learning, which supports a student-centered, rather than a teacher-centered approach, promoting students' skills in critical thinking and problem solving (Kim & Hamdan Alghamdi, 2019).

One of the most significant aspects of the recent Saudi reforms to the education system has been giving students a central role in the learning process, involving co-construction of knowledge and discussion. Bawazeer (2014) argued that "the educational field could have an unrivalled position and play an essential role in increasing awareness amongst people, educating them and teaching them to be more capable in pursuing dialogue". It is therefore vital that Saudi teachers develop the skills to create an environment that supports a culture of dialogue to facilitate students' thinking,

attract their attention, stimulate their prior knowledge, and consolidate new knowledge. Accordingly, the Saudi Ministry of Education has provided a number of training courses to develop teachers' skills and support the effective implementation of the dialogic teaching approach, such as training in inquiry-based learning and collaborative learning.

Meanwhile, there are doubts about the progress of these innovative policies. For example, Oyaid (2009) argued that "Saudi Arabia, like other Middle Eastern and oriental nations, gives teachers a special respectful status and the relationship between teachers and their students is a one-way relationship, in which students are lectured and instructed with little space for dialogue". Moreover, in their research Alfayez and Alshammari (2017) concluded that Saudi schools currently possess insufficient "educational dialogue practices, and thus a lack of opportunity for learners to express their opinions independently". Additionally, several studies during the last decade have found that teachers in Saudi Arabia typically use traditional teaching methods (Alanazi & Widin, 2018; Almuntasheri, 2015; Quamar, 2021).

In the Saudi education system, the time allocated for each lesson is limited; a lesson is approximately 45 minutes. Teachers are, therefore, often prevented from adopting questioning and inquiry strategies in science lessons (Alabdulkareem, 2017; Almuntasheri, 2015). As a result, it may be difficult to involve all students in an exchange and discussion of ideas in the limited time. Thus, the role of the teacher can shift to using direct instruction, lecturing students rather than using dialogic teaching.

These challenges may have occurred due to the prevailing culture of the Saudi people, which is "still 'mono-cultural' in character: the whole population follows one religion, uses one language, has one government and has no political parties" (Bawazeer, 2014) reflected in the Saudi teachers' performance in their schools as well as their teaching methods. However, in 2003, the government of Saudi Arabia created King Abdul Aziz Centre for National Dialogue (KACND) to create a constructive dialogue for a prosperous nation, and promote a culture of dialogue and respect for difference and diversity among members of society in all its categories in order to achieve the public interest (King Abdul Aziz Centre for National Dialogue, 2022). The KACND has organized a number of programs including the educational dialogue program to develop the dialogical skills of teachers in educational and pedagogical environments.

Although the above discussion supports teachers to use the dialogic teaching approach in their classrooms, certain challenges may affect the approach under review. Not enough studies have been conducted in the Saudi context to describe the implementation of dialogic teaching and to identify the challenges that prevent Saudi teachers from applying this approach. Thus, the present study investigates the teachers' perceptions of the implementation of dialogic teaching and the challenges that may hinder teachers from employing dialogic teaching in science classrooms in Saudi Arabian primary schools.

## 5. RESEARCH QUESTIONS

This study investigates teachers' perceptions of the implementation of the dialogic teaching approach in primary science classrooms in Saudi Arabia, focusing on the following research questions:

1. How do primary science teachers implement the dialogic teaching approach in their classroom?
2. What effects do primary science teachers report for dialogic teaching on their students' learning and interaction?
3. What are the challenges of implementing dialogic teaching in their classroom?

## 6. METHOD AND PROCEDURE

### 6.1. Research Design

A qualitative approach was employed in this study. Using qualitative research provides rich detail regarding participants' perception of a problem, which enables that problem to be better understood and interpreted (Patton, 2015). This study aimed to obtain detailed views and information from the participants about the implementation of

the dialogic teaching approach in science classrooms in Saudi Arabian primary schools. Semi-structured interviews were conducted to collect the qualitative data of this study and achieve its aim. Kvale and Brinkmann (2009) noted that using semi-structured interviews with open-ended questions offers the researcher greater opportunity to ask the participants additional questions to clarify their meaning and to provide further information. Therefore, conducting semi-structured interviews allowed the researcher the flexibility to collect a rich source set of data and gain a deeper understanding of the participants' perspectives and attitudes towards the research issue.

### 6.2. Participants

The targeted population comprised all science teachers who worked in primary schools in Riyadh, the capital city of Saudi Arabia. The total population of primary science teachers was 923, all of whom were invited to participate in the study. A group of 37 teachers from the total number of participants volunteered to be interviewed. A total of 12 interviewees were selected purposefully from different areas of Riyadh, based on their different schools, years of experience, age and qualifications to achieve the aim of the study and to obtain in-depth understanding and interpretation of the phenomena of using dialogic teaching in primary science classrooms.

### 6.3. Data Collection and Analysis

The data collection was undertaken through face-to-face semi-structured interviews, conducted in Arabic, i.e., the participants' first language. Permission was sought from the Ministry of Education and each participant was given an informed consent form, written in Arabic (including the purpose of the study, the right to withdraw at any time and information concerning confidentiality) to be signed prior to the interviews, which were audio-recorded. Most of the interviews lasted approximately 45 minutes and were conducted in quiet rooms in each school. In addition, the participants' names were changed for the purposes of anonymity. The interviews were transcribed and translated by the first author, were subsequently checked and reviewed by a proficient English-Arabic speaker. The resulting data were analysed using thematic analysis (Braun & Clarke, 2006), and NVivo software to facilitate the process of generating codes and themes and classifying the latter into categories. Each participant was given a unique name starting with (ST) from (Science Teacher), followed by a number from 1 to 12 in order to protect the identities of the participants.

## 7. FINDINGS

The analysis of the qualitative data is presented under the following themes: attitude, implementation, and challenges.

### 7.1. Theme 1: Attitudes towards Dialogic Teaching

The analysis revealed that most teachers (10 out of 12) demonstrated a positive attitude towards the dialogic teaching approach in primary science classrooms, including that it helped them to engage students in the learning process. The participants stated feeling more relaxed and happier during dialogue and discussion activities, noting that they found those lessons enjoyable. Moreover, teachers referred to the importance of using dialogue in various ways, including dialogue between teacher and students, as well as between students, either in groups or in pairs. One participant responded as follows:

> *Regarding the use of dialogue in primary science classes, it is considered a very important factor as the fact is that we are dealing with people. Dealing with people is dealing with relationships or dialogue and discussion. Dialogue is not limited to the teacher only, but from the teacher and the student both* (ST10).

In addition, the interviews revealed that 11 teachers preferred using dialogue and discussion in their science lessons. For instance, one teacher stated that "I prefer dialogue, as it is an essential aspect, particularly as it links the information to the students' previous lessons" (ST3).

However, the participants also considered that dialogic teaching in primary schools could at times prove ineffective in comparison to its use with intermediate and secondary students. For example, one participant noted that "if the teachers are working in an intermediate or secondary school, this method can be effectively implemented. But I do not think the same is true of primary school students" (ST6).

The teachers in this study identified two main goals of using dialogue in science lessons: firstly, to support students' learning and understanding and, secondly, to link the scientific concepts to the students' environment. One teacher noted that:

*The goal is basically for students to learn as much as they can … when I make the lesson dialogical, and also promote discussion, I find that students are better able to concentrate and focus, which benefits them. In addition, we connect the science topics with the environment to provide an opportunity for students to share and discuss, which also improves their enjoyment and understanding of the lesson* (ST1).

A second teacher described a dialogic approach as "moving away from the routine and the traditional way, avoiding the traditional methods … achieving goals in different ways, not only through a single method" (ST7).

In addition, the teachers highlighted the advantages of dialogue in science lessons aiming:

1. To support students' learning.
2. To attract students' attention.
3. To create a positive learning environment (i.e., remove the barriers between teacher and students, promote mutual respect and freedom of expression, as well as increasing interaction and cooperation and students' engagement).
4. To develop students' confidence, leadership, thinking and problem-solving skills, and boldness.
5. To develop a culture of dialogue in the classroom.

The participants stated that several features of dialogic teaching promoted learning and developed the cultural and psychological aspects of their students. However, some teachers stated preferring to use dialogue with intermediate and secondary students than with primary students.

### 7.2. Theme 2: Dialogic Teaching Implementation

The teachers indicated five potential strategies for promoting dialogue in science lessons: teacher-student dialogue; student-student dialogue; question and answer sessions; group-discussion; and teacher-led class discussion. According to the teachers, these strategies provided opportunities for students to talk and motivate them to express their points of view to support their learning and achieve the relevant goals. For example, one of the participants noted that:

*I usually use the dialogue with students from the start. I mean that my introduction to each lesson usually begins with an exploratory question. I hear all the students' answers and take their participation into account as an introduction to the lesson. Then, at each stage of the lesson, I do not give information directly, but try to extract information and discuss this with all of the students. I also use the dialogue when we connect topics to aspects of the environment. I accept all answers, I receive and direct the answers to other students* (ST1).

The teachers referred to their roles when using dialogue in science lessons as both controller and manager. One teacher stated that "the teacher can be a guide, administrative, supervisor, maybe even regulating the dialogue" (ST10), while another described his role during the implementation of dialogic teaching as "an assistant in education so that I am not constantly delivering information to the student quickly, but instead let the student discover this information by himself" (ST4). However, although the participants support adopting the dialogic approach, they may tend to control the class, in order to avoid distraction and any diversions from the topic.

In addition, this study found that the students' role is vital during dialogue and discussion in science lessons, with the teachers concluding that they should participate, answer questions, express opinions, build knowledge, describe scientific experiments and respect others. For example, one participant noted that "the student's role is sometimes to

enrich information, sometimes answer a specific question and sometimes maybe to express a point of view" (ST12), while another indicated that "the student must be respectful, raise their hands if they wish to participate in the dialogue and not disturb the class" (ST8). This approach can help students engage effectively in science lessons, as well as collaborate appropriately with their peers to share information and build scientific knowledge.

### 7.3. Theme 3: Challenges of Dialogic Teaching

The participants generally expressed positive attitudes towards the use of dialogic teaching in their classes, stating that they were able to implement the dialogue as part of several strategies. However, they also highlighted a number of challenges, related to factors including: teachers; students; the science curriculum; the size of classes; the school; and finally, the lack of time.

One participant expressed his perception of the teachers' role in addressing these challenges as follows:

*They should explore, take training courses and keep themselves updated about what is new in education, as this represents a real weakness among teachers. The new trends in science mean that it is essential for science teachers to understand what is new in education, whether from a scientific point of view or in terms of teaching strategies, as well as teaching methods and plans* (ST10).

Another participant explained that "teachers can be an obstacle to using dialogue due to their lack of knowledge of what the dialogic teaching approach is or what is the correct way of using this strategy" (ST7). In addition, the participants pointed out that the age of primary students can hinder the use of dialogic teaching in science lessons, as well as: their level of knowledge; individual differences; skills of dialogue; issues related to being shy and introverted; and discipline problems. For instance, one teacher said:

*There are individual differences … but if I pay attention to each student, I can observe their differences, such as the shy student, who is participating, and the one who avoids participation. This allows me to notice individual differences and try to address them* (ST9).

Furthermore, most teachers (9 out of 12) reported some of the main challenges to dialogic teaching in relation to the science curriculum as relating to content and information. For example, one teacher noted that "the curriculum is dense, and it needs to be balanced between the number of science lessons … we have many topics and few lessons" (ST10). Moreover, nine of the 12 teachers considered the size of classes as a primary challenge to the implementation of dialogic teaching, with one stating that "we cannot apply the dialogic teaching approach with such a large number of students in each class" (ST3).

In addition, nine teachers indicated that the use of dialogue can be inhibited by the type of school (i.e., rented accommodation), along with a lack of resources and the size of classrooms. One teacher noted that:

*It is difficult to distribute students in groups to allow them to undertake dialogue, so I see it as being problematic in these school buildings. I consider the size of the classroom and the number of students as a hindrance, because these are not appropriate for the use of the dialogic teaching approach between students* (ST7).

Half of the participants indicated one of the main challenges to implementing the dialogic teaching approach is related to the time allocated for science lessons. For example, one teacher stated: "it is difficult for us to create a dialogue among students in so short a time" (ST10), while another noted: "a science lesson of less than forty-five minutes is not enough" (ST9).

## 8. DISCUSSION

The current study focuses on the perceptions of primary science teachers in Saudi Arabia concerning the implementation of the dialogic teaching approach in their lessons. These participant teachers generally held positive attitudes towards such implementation, due to the importance of dialogue and discussion to facilitating primary school students to engage and share ideas.

This study therefore concludes that Saudi science teachers' positive attitudes towards dialogic teaching have the

potential to influence implementation in their science classrooms. This is supported by Neil Mercer et al. (2009), who found that teachers' willingness to employ dialogic teaching in the primary science classroom supported students' learning, along with their understanding of science. In addition, Tytler and Aranda (2015) highlighted teachers' belief in using dialogue tending to help them achieve conceptual learning. The teachers in this study perceived the main purpose of using dialogue as encouraging students to learn science and connect scientific concepts to students' experiences and environment. This is supported by Alexander (2017), who identified purposefulness as one of the fundamental features of dialogic teaching, particularly as it helps teachers to plan for, and facilitate dialogue.

The findings from the current study therefore reveal the perceived benefits of using dialogue for students' learning and the classroom environment, confirming that these benefits are generally appreciated by the teachers. Supporting students' learning was the main advantage perceived by teachers when using dialogue in science lessons. The literature review indicated that the use of dialogue and discussion enables students to engage in the learning process, which helps them to build scientific knowledge (Mercer et al., 2009; Mortimer & Scott, 2003; Scott et al., 2006).

Attracting students' attention was identified as one of the advantages of using dialogic teaching in primary science lessons. This finding supports what Gillies (2020) argued, that the use of dialogue during cooperative, inquiry-based science attracts students' attention and challenges their thinking. As a result, students are likely to be motivated to share ideas and engage in discussion with others, rather than remaining silent and feeling bored.

Another advantage underlined by the teachers was that the use of dialogue in science lessons creates a positive learning environment. Teachers mentioned four positive factors that occur when using dialogue in teaching science: increasing students' interaction and cooperation; freedom to express their views; increasing respect; and breaking down barriers. This is consistent with previously reported findings (Alexander, 2017; Gillies, 2013; Kerawalla, 2015; Mercer et al., 2009; Mortimer & Scott, 2003; Scott et al., 2006), which emphasized the key role of using dialogue to enable teacher-student and student-student interactions. Furthermore, it encourages students to express their ideas freely, to respect each other, and to broadly explain their ideas and experiences during dialogue and discussion.

It was also mentioned that the use of dialogue develops students' characteristics such as confidence, leadership, thinking and problem-solving skills, and boldness. This is consistent with previously reported findings (Alabdulkareem, 2017; Gillies, 2013; Lehesvuori et al., 2017; Mortimer & Scott, 2003; Smart & Marshall, 2013), which showed that providing opportunities for students to express their thoughts freely increases students' confidence, encourages them to be bold, develops their thinking and problem-solving skills, and nurtures their leadership abilities. Thus, students can be encouraged to talk and discuss effectively, which reflects positively on their characteristics.

Teachers mentioned that developing the culture and skills of dialogue among students is an important feature during dialogue and discussion. It is important for students to know how to participate, ask questions, and respond to others. However, Alfayez and Alshammari (2017) also indicated that some teachers in Saudi Arabia face difficulties that hinder the creation of a supportive culture of dialogue, such as the teachers' lack of knowledge and training.

With respect to the implementation of dialogic teaching, the results of this study demonstrated five strategies used to promote dialogue in science lessons, including: teacher-student dialogue; student-student dialogue; question and answer; group discussion; and teacher-led class discussion. These strategies provide opportunities for students to talk and motivate them to express their points of view to support their learning and achieve educational goals. These strategies are in line with Alexander (2017) argument, that dialogic teaching can be indicated by teacher-students interaction (including teacher-led, whole class teaching and teacher-led group work), individual teacher-student interaction, student-student interaction, and questioning and responses to questioning. Thus, these activities may play a major role in supporting the implementation of dialogic teaching in science lessons.

Scott et al. (2006) stated that the role of the teacher in authoritative discourse is to direct dialogue and discussion. In the present study, the teachers identified their role in relation dialogic teaching as controlling the dialogue and discussion and facilitating students' learning. Scott and Ametller (2007) argued that meaningful science consists of

learning and teaching, including both dialogic and authoritative discourse. Moreover, Wells and Arauz (2006) stated that teachers play an important role in engaging students and facilitating classroom dialogue. However, Lehesvuori et al. (2011) argued that the teacher's role in the dialogic approach should be more of a controller and director, creating an environment for meaningful learning.

In addition, the teachers in this study perceived their students' role as being able to participate effectively; answer questions (both from teachers and students); express their ideas; construct new knowledge; and respect others. Prior research has suggested that students' role in dialogue and discussion is to construct knowledge; interact and collaborate; and share scientific opinions (Mercer et al., 2009; Scott et al., 2006). This finding indicates that teachers consider their students' roles and provide opportunities for them to participate in science lessons.

The results of the current study are significant in ensuring a better understanding of the current challenges arising from the use of dialogic teaching in science classrooms in Saudi Arabia. The teachers in this study highlighted a number of challenges hindering their implementation of this approach. One of these consisted of their own capabilities, with the findings revealing that some lack sufficient knowledge of the appropriate use of dialogic teaching, resulting in a tendency to use short questions-and-answers and an expectation that students need to remain silent unless required to answer a question. Scott and Ametller (2007) asserted that teachers need to engage students in the dialogic approach and avoid questioning them on how well they understand science. This indicates that teachers in Saudi Arabia may require additional training to enable them to use the dialogic teaching approach in an effective manner.

Another challenge identified in this study concerned students, with teachers indicating that issues related to discipline could cause misbehaviour during dialogic teaching, including an inability to control the class. This finding accords with Lehesvuori et al. (2011), who viewed discipline as one of the main factors that concerned teachers. The participants of the current study also pointed out a number of further challenges related to students, i.e., knowledge, individual differences, culture of dialogue, and some being shy and introverted. Uçak and Bağ (2018) identified difficulties arising from students' inadequate linguistic background and unwillingness to participate and share their opinions. This indicates the importance of teachers being able to address these challenges through building a positive classroom atmosphere. According to Flanders (1965), the climate of the classroom indicates "generalized attitudes toward the teacher and the class that the pupils share in common despite individual differences".

The teachers in this study indicated one of their main challenges to be the implementation of dialogic teaching as relating to the content of the science curriculum, which they stated was full of scientific information that they were obliged to cover by the end of the semester. This closely relates to Lefstein's (2010) comment that one of the main challenges of implementing dialogue in classrooms concerns an over-crowded curriculum. Moreover, the participants referred to the insufficient number of science lessons to complete the science curriculum. Chin (2006) claimed that a lack of time to cover the science curriculum, along with pressures related to accountability, often forces teachers to transmit instructions and control dialogue and discussion. This indicates that the Saudi Ministry of Education should both revise the content of the science curriculum and increase the number of science lessons, in order to enable teachers to implement dialogic teaching in an effective manner to achieve the goals of the curriculum.

In addition, the participants raised the issue of the size of their classes and the difficulties of implementing the dialogic approach with approximately 40 students. Furthermore, the lack of an assistant teacher to help control the class can lead to difficulties in dividing students into groups or conducting scientific activities that promote dialogue. Moreover, such a large number of students tends to prevent teachers from listening to the opinions of all their students, or provide sufficient opportunities to discuss and share ideas. This result is significant, particularly as it supports previous studies identifying large classes as hindering the use of dialogue and discussion (see, e.g., (Chin, 2006; Lefstein, 2010; Sedova et al., 2014; Uçak & Bağ, 2018)).

The results from the interviews demonstrate that one of the main difficulties experienced by the science teachers in the current study concerned the insufficient time available for the dialogic approach, resulting in a reversion to

more authoritative approaches. This accords with previous studies that have also found teachers being given insufficient time to ensure the engagement of all their students (Chin, 2006; Scott & Ametller, 2007; Scott et al., 2006). However, Scott and Ametller (2007) claimed that "the key to dealing with this issue is to identify those parts of the curriculum where dialogic discourse becomes important, simply because the subject matter is demanding". This can therefore allow teachers to spend time engaging students in discussing and sharing their opinions about these science subjects.

## 9. CONCLUSION

This study examines the participants' perceptions of the implementation of the dialogic teaching approach in science classrooms in Saudi Arabian primary schools. The findings of this study have significant implications in revealing how science teachers in primary schools in Saudi Arabia both perceive and implement dialogic teaching and the challenges that hinder the implementation of dialogic teaching. It concludes that, although the teachers taking part in this research demonstrated a positive attitude towards the dialogic approach and used dialogue in various ways, some tended to employ more control to avoid distraction and being diverted from the topic. In addition, these teachers feel forced to use more authoritative approaches than they would wish due to challenges concerning the effective use of dialogic teaching. The participants highlighted a number of challenges, related to factors including: teachers; students; the science curriculum; the size of classes; the school; and finally, the lack of time. These challenges may prompt teachers to resort to a traditional teaching style.

This study therefore proposes that the Ministry of Education in Saudi Arabia addresses these difficulties by: firstly, implementing training for both teachers and students on the use of the dialogic teaching approach; secondly, decreasing the number of students in each class; thirdly, revising the content of the science curriculum; fourthly, increasing the number of science lessons; and finally, extending the length of science lessons. This study is limited to interviewing a small sample of primary science teachers in Riyadh as an urban city. Therefore, the results of this study cannot be generalized. It recommends that similar research can be conducted to investigate teachers' perceptions of the implementation of the dialogic teaching approach in in other cities with a large sample, and also in intermediate and secondary science classrooms in Saudi Arabia. In addition, further research could employ observation to further enhance understanding of the practices, roles and behaviour of both teachers and students. Despite these limitations, this study provides useful overview for comparison with studies in different international contexts, in order to understand how the primary science teachers perceive and implement the dialogic teaching approach in Saudi Arabia.

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