



***An Examination of the Impact of Colour Response Cards on
Teacher-Pupil Classroom Interaction in Girls' Primary
Schools in Saudi Arabia***

Sharifah Alghamdi

Institute of Education

University of Reading

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Declaration of Originality

I affirm that this thesis in its totality is the result of my own work and includes nothing which is the outcome of work done in collaboration except where specifically indicated in the text.

Print name: Sharifah Alghamdi

Date: 23/3/2023

Signature: *Sharifah*

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Abstract

Pupils' disruptive behaviour and a lack of academic engagement are two important challenges of classroom management. They affect the teacher's ability to deliver instruction and engage pupils in learning. In this study, an intervention was designed to address these issues, using colour response cards, these being reusable signs or cards, used by pupils to indicate their responses to the teacher's questions. Colour response cards are cost-effective, simple to use, and effective for managing pupils. Pupils' perceptions of using them and the impact of these cards on teachers' decision-making were therefore investigated in this study, specifically in two girls' primary schools in Saudi Arabia.

A quasi-experimental, sequential explanatory mixed methods design was adopted with a sample of 169 pupils aged 6-7 years (School A: n=99; School B: n=70), as the research focus was on Year One primary school pupils. The disruptive behaviour and academic engagement of nine randomly selected pupils from School A and School B were recorded during mathematics lessons, using an observation checklist at three stages: pre-intervention (before using the colour response cards), introduction (while using the colour response cards), and established (after using the colour response cards). Following the intervention, a quantitative questionnaire survey was conducted to collect pupils' perceptions of using the colour response cards, while qualitative semi-structured interviews and a journal record were implemented with the participating teachers to examine their perceptions of using the cards, and gauge the impact of this approach on their decision-making.

The quantitative analysis of pupils' behavioural data, using ANOVA, revealed a substantial decrease in pupils' disruptive behaviour and an increase in their academic engagement in the intervention group, gradually becoming major by the end of the intervention. The pupils' survey results indicated that they enjoyed the colour response card approach, recognised that it helped them to actively engage in learning, and to improve their interaction with teachers. Meanwhile, the findings from the qualitative analysis of the teachers' interviews revealed that most of the teachers identified the intervention as very useful and that it helped them manage the classroom more effectively. Overall, the results demonstrated that colour response cards are effective

in reducing disruptive behaviour and increasing academic engagement among primary school pupils.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

The importance of education is extensively recognised across the globe, which can be seen from the various initiatives being undertaken by governments, communities, and social organisations to promote it as a basic fundamental right (Chandrasekhar & Mukhopadhyay, 2006; Savani et al., 2017). The focus of primary education is to increase pupils' participation and engagement in learning (World Bank, 2019). It is important to build a strong foundation at primary school level, as the pupils' initial attitudes and beliefs towards education can have a long-lasting impact on their future engagement with learning (Fitria, 2018; Robinson & Winarni, 2018). Accordingly, some researchers (Bronfenbrenner & Morris, 1998; Mahatmya et al., 2012) have identified early years education as the prime developmental period for cultivating pupils' engagement in the learning process.

It should be considered that in primary schools, pupils spend more time in formal schooling than in their own homes, constituting a complete transformation in their environment. This transition from home to school makes the classroom one of the most influential contexts during this developmental period (Bronfenbrenner & Morris, 1998). Hence, it is important to assess engagement skills at the level of primary education, as this could provide crucial information about pupils, including how they are able to adapt to the classroom environment; how they interact with their teachers and peers, etc. (Cardellino et al., 2017; Christophersen et al., 2015; Fitria, 2018; Vezzani, 2019). This early assessment can help both teachers and parents to develop essential engagement skills among pupils.

Pupil engagement can be understood as the degree of attention, interest, and passion displayed by those who are meant to be learning or who are being taught, which extends to the level of their motivation for learning and educational progress (Azlan et al., 2019; Hill, 2018). While several older studies (for example, Christenson et al., 2012; Fredericks et al., 2004) have linked pupils' academic engagement with successful learning, more recent studies (for example, Sullivan et al., 2014; Williams, 2018) have considered pupil engagement as a multi-dimensional construct, defining various models. These models relate to behavioural, emotional, and cognitive engagement. Behavioural engagement is concerned with pupils' participation in

learning, including academic, social and extracurricular activities, while emotional engagement relates to the sense of connectedness and emotional reactions in classrooms and schools, and cognitive engagement pertains to pupils' investment (motivation, self-assessment, self-regulation, etc.) in learning (Finn & Zimmer, 2012). The concept of pupil engagement is based on the belief that learning improves when pupils are actively involved in their learning, whereas their learning suffers when they are bored or disengaged (Tze et al., 2016). Hence, pupils' active engagement is a common goal or objective expressed by educators (Chukwuemaka et al., 2017).

Accordingly, Hargreaves (2004) argues that pedagogy, at its best, should not only focus on the teaching methods and strategies that can help pupils to learn, but it should also attend to strengthening their capacity to do so. The consequences of poor engagement of pupils in learning are reportedly challenging, and engaging such pupils in the learning process is considered to be one of the most complex and demanding tasks facing educators (Barghaus et al., 2016; Taylor & Parsons, 2011).

In particular, disruptive behaviour has been identified as one of the main factors affecting pupils' engagement in the classroom; it affects both teachers and classmates in the same space (Bosah et al., 2016; Esturgo-Deu & Sala-Roca, 2010). Engagement may be influenced by various factors, including the teacher's ability to manage the classroom, the actual classroom environment, the overall school environment, pupils' abilities, and parental support (Cardellino et al., 2017; Christophersen et al., 2015; Fitria, 2018).

1.2 Statement of the Problem

It has been claimed that problems relating to pupils' behaviour are among the biggest difficulties encountered by teachers (Billingsley, 2001; Darling & Hammond, 2003; Muscott, 1987; Nash et al., 2015; O'Connell, 2017; Williams, 2018). Pupil misbehaviour has prompted 40.7% of state-sector schoolteachers in the United States to declare that it interferes with their ability to teach (Roberts et al., 2014). However, relying on preventive approaches, such as meting out punishment, can be less effective than interventional approaches, such as collaborative learning, in that the latter can actually change pupils' behaviour and attitudes towards learning (Deb et al., 2016; Jayman et al., 2018). It should also be considered that where there is a great deal of misbehaviour in a mixed ability classroom, even the behaviour of normally well-

behaved pupils can begin to deteriorate (Barth et al., 2004). Therefore, it would seem imperative to identify and implement approaches that will ensure that pupils engage with learning and not with disruptive behaviour.

One study in Saudi Arabia found that primary school pupils were displaying many behavioural problems, including lying, stealing, and aggression (Aladasani, 2016). It was revealed that pre-schoolers expect physical punishment for bad behaviour or disobedience, this being more commonly administered to male than female pupils (Basyouni & Chahine, 2011). Nevertheless, no previous studies have investigated the impact of low-cost intervention strategies in the context of Saudi Arabia, for example, the impact of colour response cards on pupils' behaviour, especially in terms of their academic engagement and disruptive behaviour. The strategies for managing pupils' behaviour involve considering pupils' cognitive, emotional, and basic psychological needs (Fitria, 2018; Robinson & Winarni, 2018). In addition, Watson et al. (2016) state that teaching approaches need to be fun and engaging, potentially leading to pupils' increased participation in learning. Equally, these approaches should be cost-effective and easy to implement with actively engaging pupils in their learning and reducing disruptive behaviour. This will result in improved teaching efficiency once the formula for their effective implementation is established. Accordingly, for this current study, an extensive review of the literature was conducted to identify the various factors influencing pupils' academic engagement and disruptive behaviour, as well as to formulate effective active learning strategies for managing pupils' active engagement and disruptive behaviour.

1.3 Research Context

Active learning strategies consist of any learning activities where the student or pupil participates or interacts with the learning process, as opposed to passively taking in information. Whilst there is a large body of published data in the United States regarding the impact of adopting active learning strategies in the classroom on pupils' behaviour and academic achievement across age groups, no such studies have been conducted in Saudi Arabia, to date. Pupils' behaviour, combined with differences in learning culture and lifestyle in that country, can vary greatly from what is experienced by teachers in the West, for example, in the United States or United Kingdom. Teachers in Saudi Arabia have traditionally been regarded as authority figures, mainly

involved in presenting knowledge, rather than facilitating learning (Alrabai, 2014). In contrast, teachers in the United States tend to be less authoritative and more inclusive, enjoying greater autonomy in selecting their teaching strategies (Lewis, 2016). More differences are explored in Chapter Two in relation to teaching and learning practices. What becomes evident is that the research findings for the impact of using response cards on pupils' behaviour in Western countries might not be applicable to pupils in Saudi Arabia. Consequently, there is a need for in-depth research to assess the impact of colour response cards on pupils' behaviour in Saudi Arabia.

In light of the above, various active learning strategies were reviewed to identify appropriate strategies for the Saudi context. This study involves analysing the impact of colour response cards (an active learning technique identified from the literature review) on managing academic engagement and disruptive behaviour in Year One of Saudi primary schools. That is, this study sought to fill this gap by investigating an active learning approach, namely, response cards, specifically in primary schools in Saudi Arabia. The aim of this was to consider how such use could affect pupils' behaviour in terms of reducing disruptive behaviour and promoting engagement in lessons. The relevance of Saudi Arabia as the current study context is explained in the following subsections.

1.3.1 Socio-cultural Context of Saudi Arabia

Islam has an extremely strong influence on Saudi culture and society. The religious expectations are embedded in the daily lives of Saudis, as demonstrated in their various actions and social interactions. Islam, therefore, guides and informs many aspects of life, both spiritually and practically. This guidance is observable in people's eating habits, the way they dress, and the way in which emotions or vices are dealt with, for example, anger and greed. Moreover, Islam impacts the way that pupils are brought up and educated. In essence, it teaches patience, respect for elders, especially parents and teachers as well as placing a high value on education. Parents are expected to teach these religious principles to their pupils, upholding Islamic values and not departing from them. However, in terms of gender, there are differences in the way Islamic rules are applied to men and woman, resulting in gender segregation, and more social and cultural restrictions on the women and female pupils.

Notwithstanding the above, changes are taking place in Saudi society. For example, there have been recent initiatives to promote female participation in the economy by providing women with training and opportunities. This has included permitting women to drive. Overall, female participation in various roles has increased in Saudi Arabia. This has changed the nature of the relationship between the genders and reduced the boundaries between male and female workers. The relaxation of certain socio-cultural rules, recently put into effect by King Salman, has meant more women's rights. For example, women can apply for a passport and travel outside the country without requiring the approval of a male guardian.

1.3.1.1 The Education System and Issues Related to Disruptive Behaviour and Academic Engagement in Saudi Arabia

The level of control noted above may also be observed within the Saudi education system, where the classroom is teacher-, rather than pupil-centred (Yasmin & Sohail, 2017). Socio-cultural factors in Saudi Arabia differ widely from those of Western countries in relation to, for example, decision-making ability, independence, and freedom. To clarify this further, pupils view their teachers as authoritative and adhere strictly to their instructions, without making any independent decisions about their learning (Alharthi & Lebeau, 2020; Almejmaj et al., 2017). Accordingly, learners' behaviour and attitudes in Saudi Arabia may differ from those of learners in other countries, as Saudi pupils are less interactive compared to pupils in Western countries who are more friendly and interactive with their teachers than pupils in the West (Alqahtani & Pfeffer, 2017; Alshafi & Shin, 2017; Unruh & Obeidat, 2015). Added to this is the phenomenon of 'too much teacher talk', which dominates the Saudi classroom, where pupils become mere recipients of information. In this case, the main focus for the teacher is the production of knowledge, with mostly one-way communication (teaching), rather than supporting two-way communication and facilitating autonomous learning among the pupils.

In addition, various socio-cultural factors, such as a lack of awareness of effective parenting styles (on the part of the parents), a lack of understanding of the pupils' interests and development goals, poor socio-economic conditions as well as discord between parents and other family members, have been identified as having a negative impact on the psychological development of pupils in Saudi Arabia

(Aldawsari, 2020; Alkhalfaf, 2015; Alsehaimi et al., 2017; Ghafour, 2012). Another factor contributing to disruptive behaviour could include Saudi educational policy, which states that if pupils fail to pass a supplementary examination, they must repeat the school year. This can affect learners' self-esteem and motivation, as they may find it monotonous to repeat the learning content, which then triggers their unacceptable behaviour. Similarly, pupils' self-confidence could be affected, and they might lose the respect of their peers. From these findings, it may be deduced that the increasing prevalence of disruptive behaviour and reduced academic engagement among pupils in Saudi Arabia can be correlated with the prevailing socio-cultural factors that have been identified in the country (Abdel-Fattah et al., 2004; Aldayel et al., 2020; Alshahrani & Algashmari, 2021; Altwaijri et al., 2020; Maajeeny, 2019; Shaikh et al., 2020).

Nevertheless, the learning environment in Saudi Arabia is changing to become more supportive of learner autonomy and the learner-centred approach, defined by Donovan et al. (2000) as one where teachers value the importance of building on conceptual cultural knowledge and practices that the learner should adopt in the classroom. Whilst some Saudi cultural features, such as parenting styles, usually blend well with the education system, there are other cultural aspects like gender inequality, which can disadvantage girls by harming their self-esteem and confidence, as they may consider themselves less valuable than their male peers. On the positive side, the educational curriculum is designed according to principles that reflect the Kingdom's culture and values, while also integrating modern approaches. Thus, it includes features such as flexibility, freedom, physical development, skills and knowledge development, respect, character building, and the development of sound human values (Al-Turaiqi, 2008; International Labour Conference, 2007).

However, many pupils appear not to thrive in this educational environment. For example, Maajeeny (2018) found that over 20% of pupils in Saudi Arabia experience difficulties in peer relationships and lack the necessary prosocial behaviours. In addition, issues relating to engagement, such as having attention deficit hyperactivity disorder (ADHD), were identified as being common in primary schools, with a prevalence of 2.7% (Abed, 2018; Alzaben et al., 2018), compared with the global prevalence of 2.2% (Fayyad et al., 2017). Moreover, the manifestation of ADHD among pupils in Saudi Arabia is increasing, with it becoming one of the main factors

affecting pupils' learning engagement. More generally, disruptive behaviour and poor academic engagement are major issues identified in Saudi schools, and these affect teachers' practices and decision-making (Alsharari, 2016). Another important factor to consider is the typical class size in Saudi Arabia, notably in public-sector schools, where the average class size is 45 pupils (Alsauidi, 2016; Duchaine, 2011). In contrast, private schools have smaller class sizes, which is why they are preferred by many Saudi parents (Alsauidi, 2016), although the majority of pupils attend public-sector schools (Statista, 2020).

Added to this, teachers can face major behaviour challenges during the transition from kindergarten to primary school (Al-Hezam, 2017; Chan, 2012). The shift towards primary school involves leaving a comparatively unstructured setting in favour of a more formal one, where pupils are expected to sit still and focus on academic topics and tasks for longer periods of time (La Paro et al., 2006; Sink et al., 2007;). Pianta and Rimm-Kaufman (2006) contend that deciding how well pupils will cope with these changes relates to their behavioural engagement in learning.

To summarise, the socio-cultural influences in Saudi Arabia permeate the education system and the learning environment of the home. Whilst this manifests its influence in a number of ways, one important one is in the lack of learner autonomy that perhaps contributes to the poor behaviour of some pupils in public-sector primary schools.

1.3.1.2 Female Teachers

In educational institutions – including universities, colleges and schools that are divided according to gender – the teachers, general staff, and school leaders are all employed to teach or work in either male or female institutions. The Ministry of Education is the government body responsible for hiring teachers, paying their salaries as well as providing services and resources, including overseeing the curriculum and organising professional training programmes. It was observed by Sink et al. (2007) that most school heads including both male and female heads are Saudi citizens and possess an educational qualification that is lower than a bachelor's degree. Moreover, female head teachers are not provided with adequate training programmes, as a result of which there is a direct impact on the quality of girls' education. Alfozan (1989) established the need for teacher training among both male and female school heads in

Riyadh province. Similarly, Gahwaji (2013) identified that a lack of proper teacher training in pedagogic skills is one of the main challenges found in Saudi Arabia's pre-schools. The results of the above investigations show the demand for training both male and female head teachers, and in particular, female leaders (Alsharari, 2010).

In government schools, attended by 80% of pupils, teachers encounter pupils with varying levels of disruptive behaviour, coupled with their own lack of teacher training and experience to manage the classroom environment, despite their attempt to implement various strategies (Aburizaizah et al., 2016). In addition, large class sizes, poor quality instruction, troubled pupil/teacher relationships, and inadequate services are the key issues identified that negatively affect the management of disruptive behaviour and pupils' academic engagement (Alsauidi, 2016; Alsehaimi & Alanazi, 2017). It could be argued that the lack of clarity in government policies, lack of knowledge as well as lack of support and training for teachers, particularly for women, have all had a major negative impact on teachers, who not only face problems in managing disruptive pupils, but also, lack the motivation to teach them (Abaoud, 2013; Kamal, 2016).

1.3.1.3 The Present Study within the Cultural Context

The proposal of behaviour management approaches that have been found to be effective in Western countries might not produce the same results in Saudi Arabia, since the influencing factors, including socio-cultural components, the attitudes of pupils and teachers, curricula, and teaching strategies, often differ from those that are inherent in the former countries. Given the rapidly changing nature of Saudi Arabia, coupled with the growing behaviour issues in schools and lack of academic engagement among pupils, it was considered important to seek an approach that would, in particular, foster pupils' autonomy, while remaining compatible with teacher-centred schooling. Thus, any conflict with the values of the surrounding society would be avoided and in light of this, the coloured response card approach was adopted.

1.3.2. Choice of Mathematics as a subject

The decision was made to investigate the research problem exclusively in the context of mathematics lessons, and there were several reasons for this. First, it can be difficult for teachers to engage pupils effectively in learning mathematics, as pupils often experience various learning difficulties with tasks, such as performing arithmetic computation and applying computational skills (Harris & Bourne, 2017). Lack of regular practice, lack of tutoring, and an inability to understand or carry forward the concepts are a few of the issues that make it difficult to acquire mathematics skills. Moreover, pupils can exhibit low perception of their mathematics ability, have little interest in the subject, and view it as difficult, thereby leading to anxiety (Organization for Economic Cooperation and Development [OECD], 2014). Maloney et al. (2014, p.404) define mathematics anxiety as “feelings of fear, apprehension, or dread that many people experience when they are in situations that require solving math problems”. In addition, some studies have demonstrated that preschool teachers possess limited knowledge of pedagogic approaches to teaching mathematics. Therefore, they may find it harder to teach mathematics lessons and address pupils’ questions (Lee et al., 2018).

1.3.3. Focus on teachers’ perceptions and assessment practices

Most studies involving response cards that have examined the impact of different teaching and learning techniques have either focused purely on teachers’ perceptions and practices (Hamlin et al., 2008), or on pupils’ abilities and attitudes (Singer, 2013). This limitation is addressed in the current study by investigating how the effective use of teaching and learning techniques can provide teachers with direct feedback and favour valid instructional decisions, thus resulting in on-task behaviour (Randolph, 2007). Specifically, the focus of the current research is on assessing the impact of colour response cards on pupils’ behaviour (disruptive behaviour/academic engagement) as well as the perceptions of teachers and pupils regarding the use of these cards.

1.4. Intervention to Manage Disruptive Behaviour and Academic Engagement

Disruptive behaviour issues can be tackled by using diverse active learning methods and materials, which have been shown to be effective in reducing disruptive behaviour

and enhancing academic engagement (Christle & Schuster, 2003). However, different active learning methods aimed at behavioural engagement may have different effects on managing academic engagement and disruptive behaviour. Therefore, active learning methods or approaches must be designed and implemented to suit various settings, such as schools, whilst also taking into account factors like pupils' needs, abilities, competencies, and culture, as well as teachers' competence, abilities, attitudes towards teaching and managing disruptive behaviour as well as their decision-making.

One team of researchers (Education Endowment Foundation, 2020) recommended a series of proactive and reactive criteria for managing disruptive behaviour in the classroom, including the following:

Know and understand your pupils and their influences; Teach learning behaviours alongside managing misbehaviour; Use classroom management strategies to support good classroom behaviour; Use simple approaches as part of your regular routine; Use targeted approaches to meet the needs of individuals in your school; Consistency and coherence at a whole-school level are paramount. (Education Endowment Foundation, 2020, p.1)

This would suggest that there is a need to identify a method that can be easily implemented, effective, and efficient for managing disruptive behaviour. The different approaches or teaching strategies available for managing such behaviour can be categorised into reactive (focusing on the individual case and cure for the problem of disruptive behaviour), intervention (focusing on the problem and other relevant factors influencing the problem, identifying a solution, and then evaluating/testing it), and preventive approaches (focusing on reducing the problem of disruptive behaviour by adopting various positive measures) (Desrochers & Fallon, 2014). An extensive literature review (see Chapter Two) in relation to teaching strategies for reducing disruptive behaviour, elicits those interventional approaches that are more effective for addressing disruptive behaviour, as they consider the problem, identify its influencing factors, and evaluate the proposed solution. Using these solutions, pupils/teachers are introduced to new behavioural management and teaching approaches, which can be practised after evaluation.

One of the advantages of intervention approaches is that they are frequently reviewed and keep evolving (through research studies) over time, according to changes in the classroom environment. Active learning techniques have been

considered as effective intervention techniques for classroom management and the behavioural management of pupils in various studies (Chen & Su, 2018; Dewitt & McLuskie, 2019; Lynch & Keenan, 2018; Unamba et al., 2006; Ural et al., 2017; Yunus & Chien, 2016). In this context, the present study involved reviewing various learning techniques to identify the most appropriate and feasible intervention for first year primary school pupils in the Saudi context. Active learning methods, such as response cards, are considered to be most appropriate, as they actively engage pupils. For example, response cards shift pupils' attention towards learning and their classroom activities (Kaplan et al., 2010; Lee et al., 2017). Moreover, these cards are easy to use in the classroom and support teachers in their attempt to achieve better classroom management (Frondeville, 2009; Christene et al., 2019).

Response cards are defined as reusable signs or cards that are used by pupils in their learning, giving them a means of indicating their responses to the teacher's questions (Gardner et al., 1994). They vary in form and can either be standard, commercially available white boards, on which pupils write short responses, or more sophisticated answers with additional detail, such as pre-printed or colourful cards, with specific key terms, for example, true/false, yes/no, or even letters ('A', 'B', 'C', or 'D') (Hamlin, 2008). Research on response cards has been diverse and conducted in different settings, with various types of response card being considered. Notably, in the United States, studies have investigated the effect of using response cards on pupils in different education settings, such as in general kindergarten classrooms (Wood et al., 2009), primary schools (Munro & Stephenson, 2009), and high schools (McCargo, 2017). Conversely, other studies have focused on the impact of response cards on teachers, for example, Hamlin et al. (2008), although this study was based on a video-recording of a simulated, rather than actual class. The above study examined the impact "of colour versus white response card formats and pupil response accuracy on teacher instructional decision making" (p.24). Previous studies on response cards (Christie et al., 2003; Kellum et al., 2001; Randolph, 2007) have been focused on both blank (where the pupil writes the answer in response to the teacher's question) and pre-printed cards (such as Yes/No or A/B options printed on the cards), whereupon the pupils use the cards in response to questions framed by the teachers.

The use of colour response cards is based on Hamlin et al.'s (2008) research, which found differences between coloured and white response cards. The results of

their study also suggested that the teacher's effectiveness in making appropriate decisions during the instruction of large groups may be enhanced by using colour coded, rather than white response cards. However, their study was based purely on a teacher watching a simulated class, unlike the present study, where a real class was observed. After taking into consideration the problems identified in the previous subsections, the impact of using colour response cards with pupils in primary schools was deemed to be a fruitful research avenue.

Irrespective of the above, no studies have adequately investigated the impact of using coloured response cards on pupils' engagement and behaviour in a real classroom setting in Saudi Arabia. The existing studies have either had methodological constraints, such as using only one method, or a survey to collect data on a specific aspect, such as pupils' perceptions (Alhalabi & Alhalabi, 2017). Another constraint is that the previous research has only sampled older pupils, for example, those in the third year or above (Alhalabi & Alhalabi, 2017; Goodnight et al., 2019). Meanwhile, others have looked solely at a specific field, like the application of colour response cards in language teaching (Munro & Stephenson, 2009), at the expense of research on other school subjects.

In order to address the research gap identified above, simple coloured response cards (green cards to indicate that a pupil knows the answer, and red to indicate otherwise) were used as intervention methods for managing destructive behaviour and academic engagement. The reason behind choosing green and red is because these represent opposites in many societies, including Saudi society, where they communicate positive and negative meanings, respectively. For example, a green traffic light is positive for a driver and associated with moving forward, while a red light is negative and associated with stopping. The use of green and red cards, without any words, provides a simple, intuitive, and attractive means by which pupils can signal their awareness of knowing an answer (or not knowing it) to the teacher.

Response card techniques may be considered as easy to use (Marquez et al., 2017; Paulish, 2018), compared to other active learning techniques such as jigsaws, gamification, and automated response systems, which often require high investment and training (Aggarwal, 2018; Przybylski & Mishkin, 2016). Considering the focus of this study, which is on behaviour management among primary school pupils, there was a necessity to use an intervention that was straightforward to adopt and easy to

implement. In this context, a response card intervention can be considered as an effective technique, which can be implemented at low cost in Saudi Arabia.

1.5 Research Aims and Objectives

The main purpose of this study was to investigate the impact of using colour response cards on primary school pupils' academic engagement and disruptive behaviour, as well as on teachers' classroom management and teaching practices. This study addresses the gaps that were identified in the extant literature on the topic of using response cards, notably in Saudi Arabia. First, most studies on the use of response cards in the classroom have been centred on the pupil, rather than the teacher, and there has been little comprehensive research on how teachers react to the use of such cards, or on their subsequent classroom instruction. Accordingly, this study aimed to analyse the perceptions of teachers and pupils regarding the use of colour response cards. Second, this study was aimed at extending the literature by investigating whether the simplest possible design of colour response cards (in the present case: wordless red card/wordless green card) can reduce destructive behaviour, improve learning, and have an impact on primary school pupils' behaviour.

Accordingly, the following objectives were outlined for this study:

- To investigate whether the use of colour response cards has an impact on pupils' academic engagement in the classroom
- To investigate whether the use of colour response cards has an impact on pupils' disruptive behaviour in the classroom
- To investigate pupils' perceptions of using colour response cards
- To investigate whether the use of colour response cards has an impact on teachers' perceptions, classroom management, and assessment practices

1.6. Summary of Chapters

Chapter One: This chapter has discussed the problem statement, the socio-cultural context of Saudi Arabia, knowledge gaps, and need to conduct a study on the impact of colour response cards, specifically in terms of academic engagement and disruptive behaviour among pupils. Accordingly, it has set out the aims and objectives of the

study. The remainder of this thesis is divided into five chapters, an outline of each being provided below.

Chapter Two: This chapter reviews the literature in relation to different aspects, which include the search strategy for the literature review, pupils' classroom engagement in the context of Saudi Arabia, the importance of learning and behavioural engagement in learning, as well as proposing a conceptual framework for behavioural management (academic engagement and disruptive behaviour). In addition, active learning approaches for managing academic engagement and disruptive behaviour in classroom were reviewed with a focus on classroom participation, teacher-pupil feedback, and formative assessment. The review resulted in finding many relevant approaches out of which colour response cards were identified to be the most appropriate and effective in the context of Saudi Arabia. Accordingly, colour response cards impact on pupils and teachers and its benefits were reviewed. In addition, this chapter presents Self-determination Theory (SDT) and Self-regulation Theory (SRT), whilst also explaining the rationale for selecting SDT over SRT, which provides the philosophical and theoretical background to the research.

Chapter Three: This chapter explains and justifies the selection of the research methods, data collection, and process of analysis adopted for this study. The selected research paradigm and philosophical assumptions determined in this study are also discussed. There is also a description of the mixed methods design adopted, and how this was deployed using both the quantitative (structured observation, survey) and qualitative approaches (semi-structured interviews, journals). The sampling of the subjects is also reported, followed by a discussion of the reliability and validity of the data, ethical considerations and ending with a summary.

Chapter Four: This chapter presents the study findings, based on an analysis of the collected data, using techniques that include ANOVA testing (for the quantitative data) and thematic analysis (for the qualitative data). The findings are presented in relation to the three research questions, which pertain to the impact of colour response cards on pupils' behaviour; pupils' perceptions of using colour response cards, and teachers' perceptions of using colour response cards in the classroom.

Chapter Five: This chapter discusses the findings with reference to the literature and other reports that are relevant to the three research questions that were formulated for the study.

Chapter Six: This, the final chapter, reflects on the main study, drawing conclusions, pointing out the theoretical and practical implications, discussing the limitations, and making recommendations for further research.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The concepts relating to pupils' engagement in learning are discussed in this chapter. Firstly, the search strategy for the literature review is explained. Then I will describe and examine the classroom environment in the Saudi context through shedding light on the problems faced in the classroom, especially those related to disruptive behaviour and lack of motivation for learning. Research has revealed a strong need for effective ways not only to improve pupils' behaviour, but also, more importantly, to enhance their engagement in the classroom to help them achieve better results. Then, in the literature review, a conceptual framework is developed to include the main factors research has shown to influence pupils' engagement in the classroom, and approaches adopted as interventions to address the issues associated with academic engagement and disruptive behaviour.

Various active learning techniques are then reviewed to identify the most feasible and appropriate intervention technique that can best fit in the Saudi context, a process that led the researcher to identify Colour Response Cards (CRCs) as the most appropriate technique. There then follows an extensive review of literature relating to the use of CRCs. It is then reported that following this analysis, it became clear that studying the significant effects of CRCs on both the teacher and pupils led the researcher to identify Self-determination Theory (SDT) (Deci & Ryan, 1985) and Self-regulation Theory (Bandura, 1991) as highly relevant theoretical frameworks in which to frame the current study. Theoretical underpinnings are discussed towards the end of this chapter because the key objective of the research was the practical purpose of identifying an effective strategy to increase academic engagement and reduce disruptive behaviour, in the specific context of Saudi Arabia. Having identified CRCs as an appropriate approach, the review reported in this chapter of empirical studies that have implemented the CRC intervention revealed that they did not have a strong theoretical foundation. Hence, the initial part of the literature review has focused on this practical issue, with the consideration of an appropriate theoretical framework discussed later.

2.1.1 Search Strategy for the literature Review

There are two main types of literature review: the systematic review, which is conducted specifically for a journal paper or chapter in a graduate thesis, and the commonly found literature review or 'background' section. The literature review summarises the existing literature and usually identifies the knowledge gap being addressed by the empirical study (Sylvester et al., 2013). In contrast, the purpose of a systematic review is to deliver a meticulous summary of all the available primary research in response to a research question, while following the established guidelines, such as the preferred reporting items for systematic reviews and meta-analyses (PRISMA).

In this chapter, a targeted or focused literature review strategy is described in the form of a non-systematic review. Such reviews are usually informative for identifying and addressing research questions and objectives (Huelin et al., 2015). This form of literature review is an original and valuable research framework in and of itself (Paré et al., 2015). The implications of not conducting a systematic literature review are that some of the relevant research literature might be overlooked. In contrast, this approach is largely based on the knowledgeable selection of relevant, high-quality literature on the topic of interest, reflecting an evidence-based decision-making strategy. Nevertheless, there is the risk that some important literature, such as policy documents and institutional or government reports (grey literature), might be omitted. Conversely, sources of this nature are included in non-systematic reviews, thereby allowing the researcher to explore the topic in detail from different perspectives.

In this study, through a non-systematic review, I initially searched the research literature that focused on the factors influencing learners' behaviour, pinpointing the strategies used in order to improve their academic performance. Moreover, I looked at the most recent literature published within the last 10 years including international journal articles and reading books in order to see what strategies were used around the world and see what might be pertinent to the Saudi context.

2.2. Pupil Engagement in the Classroom: The Context of Saudi Arabia

When considering the issues surrounding pupils' engagement in the classroom and the management of their disruptive behaviour, it is essential that effective strategies are put in place in institutions in different contexts. In the context of Saudi Arabia, for instance, academic engagement has been part of recent educational investigations (Aburizaizah et al., 2016; Alsaudi, 2016; Alsehaimi & Alanazi, 2017; Borg & Alshumaimeri, 2012), because employing various strategies to promote academic engagement can enhance the learning process accordingly (Aburizaizah et al., 2016; Alsaudi, 2016).

There is a need for active contributions from teachers, parents, and schools to address the issues associated with pupils' academic engagement and disruptive behaviour, so as to improve their academic performance and drive their development (Alsaudi, 2016). However, gaps between the anticipated academic productivity and the learning support received from schools/universities have been observed in Saudi Arabia (Borg & Alshumaimeri, 2012). The increasing diversity of schools (public sector, private), with varying educational quality and support offered, could be one of the reasons for the widening gap between pupils' productivity and the support received. It has been identified that private middle schools age (11-14), which serve more advantaged pupils, display higher quality teaching and higher levels of pupil engagement, compared with government-run ones (Aburizaizah et al., 2016). Alsaudi (2016), for instance, reported that large class size, quality of instruction, and pupil/teacher relationships were major issues affecting pupils' engagement in Saudi public-sector schools – where more than 80% of pupils were enrolled (Statista, 2020), in contrast to private schools. A systematic review (Alsehaimi & Alanazi, 2017) of the literature (1990-2016) on pupil neglect in Saudi education identified that despite government programmes, the services available receive inadequate investment. Hence, they are not capable of preventing neglect (negligence of pupils in schools), reflecting poor support and services in schools. The above-referenced studies reflect the issues associated with the Saudi education system in promoting pupils' academic engagement.

Minor disengagement activities, such as a lack of attention or lack of motivation, have been observed as major challenges to academic engagement in Saudi Arabia (Alhubaishi & Aljuhani, 2021; Alkhannani, 2021). It has also been ascertained that

there is a lack of interest in teaching pupils with disruptive behaviour and poor engagement, as well as there being a lack of training and support for those having to teach such pupils in Saudi Arabia (Abaoud, 2013; Kamal, 2016). The subjects taught in school and class size have, likewise, contributed to the lack of motivation and engagement. In particular, mathematics, compared with other subjects, was identified as causing particular stress and anxiety among young pupils (7-15 years) (Al Mlhem, 2018; Alabdulaziz et al., 2017; Yamani, 2017). Thus, it would appear that the subject, lack of teacher training, pupils' behavioural features, and class size are some of the factors influencing pupils' academic engagement in the classroom in Saudi Arabia.

The widening gap between private and public educational institutions' teaching quality and standards, the reforms being introduced into the education sector, the growing number of pupils with autism, dependency on expatriate teachers from different cultural backgrounds are some contextual issues affecting pupils' academic engagement and disruptive behaviour in Saudi Arabia (Al Makadma & Ramisetty-Mikler, 2015; Hashim & Non, 2018; Ismail, 2016). As will be discussed in full later in the chapter, various techniques can be used to address the issues related to academic engagement and disruptive behaviour. Hence, there is a need for extensive research on improving academic engagement and managing disruptive behaviour by using various tools and methods that could be quickly introduced into Saudi classrooms. Consequently, the next section focuses on the significance of learning approaches in improving pupils' academic engagement and improving their behaviour in the classroom.

2.3. Importance of Learning

Despite an increase in access to education worldwide, there is still a lack of information on pupils, in terms of identifying those who are learning or not learning. This is classed as one of the main global learning challenges when assessing educational goals (World Bank, 2019). According to one World Bank report, the productivity of 56% of pupils across the world is less than half of what it could be, if they enjoyed education of an adequate standard and full health (World Bank, 2019). Therefore, the learning approaches adopted in schools must be effective in engaging pupils in their learning. Education, when delivered well, can generate human capital (individuals' skills and knowledge) and benefits to individuals (raised self-esteem,

employment opportunities, higher earnings) and countries (long-term economic growth, reduced poverty, industrial innovation) (Kayani et al., 2017; Matherly et al., 2017). It has been ascertained that an increase in pupils' engagement can enhance learning processes (Christophersen et al., 2015). Accordingly, education is likely to be improved by implementing approaches to foster active participation, and the engagement of pupils in their learning.

The current study is focused on the behavioural issues witnessed among pupils in the classroom, as related to their disruptive behaviour and academic engagement. However, before focusing on the solutions, it is essential to understand the nature of the problem. Accordingly, the next section explains the issues of interest, including academic engagement and disruptive behaviour in the context of this study.

2.4. Behavioural Engagement in Learning

2.4.1. Academic engagement and disruptive behaviour

Academic engagement is defined as pupils' motivation to participate in classroom activities (Anderman & Anderman, 1999). Such participation can take the form of "writing, raising hands, answering questions, talking about the lesson, listening to the teacher, reading silently, or looking at instructional materials" (Fabiano et al., 2017, p.5). Additionally, academic engagement is considered as a reflection of the pupils' sense of belonging to their school through the relationship with their teachers and classmates (Hughes & Kwok, 2007). There are various forms of academic engagement in the classroom-based learning setting. Some frequently identified forms of engagement are behavioural, emotional, and cognitive (Fredricks et al., 2004; Parsons & Taylor, 2011). Emotional engagement is about pupils' willingness to work or participate in the school environment, which reflects their reactions to teachers and peers (Fredricks et al., 2004). Meanwhile, cognitive engagement is defined as the level of effort exerted in an attempt to learn new ideas or difficult skills (Parsons & Taylor, 2011). Behavioural engagement concerns the amount of time that pupils invest in a specific learning activity and more generally, the way that they participate in the classroom (Archambault et al., 2012).

The concept of behavioural engagement is very substantial, as a result of which it may be necessary to consider various theoretical approaches to engagement in the

extant research (Lawson & Lawson, 2013). Pupils' behavioural engagement in learning and the various factors influencing their learning behaviour have been investigated in several previous studies. These studies have considered academically engaged pupils as those who take part in lessons, notably by asking the teacher questions and spending time on learning activities (Hirschfield & Gasper, 2011; Ladd et al., 1999).

In contrast, disruptive pupils are those who engage in activities, where they, for example, act aggressively, talk out of turn, and yell in a way that disturbs their peers and teachers in the classroom, while teaching and learning are meant to be taking place (Fabiano et al., 2017). However, these behaviours (academic engagement and disruptive behaviour) may differ from each other to some degree and be influenced by a number of factors. For instance, it is held that the display of disruptive behaviour is related to anger, while withdrawal is more closely associated with sadness (Roeser et al., 2002). As discussed above, behavioural engagement in the classroom can be analysed using concepts such as academic engagement and disruptive behaviour, the relationship between engagement and factors of influence (for example), teaching approaches, the classroom environment, pupils' attitudes to learning, and so forth. Therefore, it is essential to understand how learners engage in the classroom in different contexts, and the various factors that influence their behavioural engagement.

Pupils' engagement levels in the classroom might be related to the subjects taught in schools; in the sense that pupils perceive some subjects as being interesting while others boring (ERO, 2016; Fielding-Wells & Makar, 2008). Therefore, pupils' perceptions towards a subject plays an important role in their engagement with the subject. More particularly, researchers such as Attard (2014) argued that engagement in mathematics is the 'coming together' (p.146) of cognitive, emotional, and behavioural forms, which hence, results in pupils enjoying and valuing the subject. According to Attard (2011), classroom engagement entails active participation and involvement in the activities assigned. Furthermore, some researchers have investigated different forms of academic engagement in the classroom, with regard to how it can affect pupils' school life. For example, a study by Cadima et al. (2015) examined the quality of classroom organisation, with a sample of 145 pupils in kindergarten and year one, which included creating consistent and anticipated routines to help them get to know what to expect and what was expected of them. The study

found that such routines contributed to the pupils' engagement in the task for both age groups. Hence, it is necessary to consider instructional practices and classroom management while assessing and reviewing academic engagement.

With regard to disruptive behaviour, Fabiano et al. (2017, p.5) offered a definition, namely, "pupils' action that interrupts regular school or classroom activity such as: out of seat, fidgeting, playing with objects, acting aggressively, talking/yelling about things that are unrelated to classroom instruction". Other studies have considered pupils with disruptive behaviour as those who annoy others during lessons, do not follow the classroom rules, and disrupt learning activities (Curby et al., 2009; Ladd & Dinella, 2009). Disruptive behaviour among pupils may begin in infancy, increase during early childhood, and eventually decrease through the time as the individuals learn to control their emotions (Tremblay, 2015). However, in some individuals show high levels of disruptive behaviour throughout their lives (Rogers et al., 2008).

Managing disruptive behaviour is a complex time-consuming and calls for teachers to find appropriate strategies to deal with it (Duangjit, 2013). Some common examples of disruptive behaviour in the classroom include bullying, severe disturbance, use of foul language, disobedience, and rudeness (Dada & Okunade, 2014). The strategies employed by teachers to check such behaviours include physical punishment, as well as positive and negative reinforcement (Dada & Okunade, 2014). Zakaria et al. (2013) studied the perceptions of pre-service teachers in managing pupils' disruptive behaviour, for which the findings indicated that pre-service teachers favour a teacher-centred approach, where the teacher makes decisions about discipline, pedagogy, and relationships. However, Zakaria et al. (2013) contend that the extent of disruptive behaviour can be affected by teachers' instructional decision-making. Hence, decision-making is an area where it is important that teachers display effectiveness, especially by observing pupils' levels of disruption, and making decisions, accordingly, about how that behaviour should be modified. Here, it is essential to understand pupils' classroom engagement, in order to be able to make effective decisions, which is addressed in the next subsection.

2.4.2 Pupils' engagement in the classroom

The classroom is the place where teachers interact with pupils and where learning, the crux of education, occurs. Classroom environments (learning environments) depend heavily on teachers, and the importance of their role can be identified from various perspectives. Engaging pupils at the beginning of a lesson, as well as maintaining their focus and interest, thereafter, is a challenging task (Bobos et al., 2016; Christene et al., 2019), because it is easy for pupils to deviate from the learning zone once they start participating in the lesson (Frondeville, 2009). Any learner involved in a long routine of learning may drift off at some point, whether due to the teacher's inadequate presentation, or the learner's poor engagement and inability to learn effectively (Frondeville, 2009).

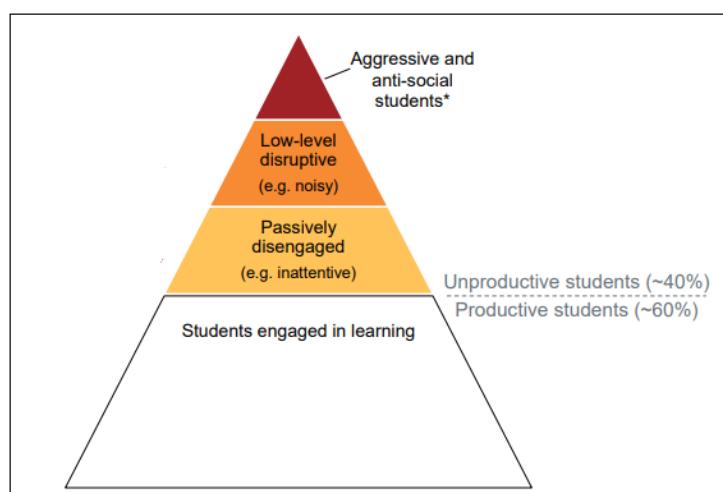
The classroom environment can be influenced by various disruptions and other issues, which not only affect pupils' engagement, but also the teacher's presentation and teaching practices (Hopman et al., 2018; Lum et al., 2017). Being clear about their teaching practices, setting high expectations for pupil achievement, and working hard to develop good relationships, with and between pupils, are all essential for teachers (Hattie, 2008; Oliver et al., 2011). In particular, a well-managed classroom will foster effective teaching and learning, resulting in enhanced pupil behaviour and achievement (Kane & Cantrell, 2010; Marzano et al., 2003). Kane and Cantrell (2010) identified that teachers' past experiences and a value-added approach in pupil management were important factors that could enhance the learning process, pointing to the importance of their role in engaging pupils in learning within the classroom. In order to manage the classroom environment effectively, the New Zealand Education Review Office (ERO, 2016) defined three main areas for attention: pedagogy (teaching practices), school culture (positive and relational culture), and success for every pupil. As mentioned earlier, the role of the teacher is very important in terms of engaging pupils in the classroom through effective teaching practices, while also developing and sustaining a positive school culture to ensure the progress of each of them. However, there are various factors that can impact on pupil-teacher engagement in the classroom, and the next subsection considers these in detail.

2.4.3. Issues of classroom engagement

Issues affecting classroom engagement include pupils' lack of interest, an ineffective school curriculum, and lack of effective teaching strategies (Angus et al., 2009; Hattie, 2008; Sullivan et al., 2014). In other words, they can be identified from the perspectives of pupils, teachers, and institutions. Hattie (2008) broadly categorised these issues from the perspective of pupils' learning; listing classroom behaviour, teacher clarity, relationships, cohesion, peers, classroom management, motivation, and teachers' expectations. Several studies in Australia (Angus et al., 2009; Sullivan et al., 2014) have ascertained that 40% of pupils aged 3-15 years are unproductive, due to disruptive and disengaged behaviour, as shown in Figure 2.1. Sullivan et al. (2014) explained that passive disengagement refers to a situation where pupils are compliant, but averse to learning, due to personal factors, such as their lack of interest, or inattentiveness. Meanwhile, low-level disruptive behaviour refers to situations where pupils are noisy, disengaged, and interrupting others. These findings from Sullivan et al. (2014) correspond to those identified in the Elton Report (Department of Education and Science and the Welsh Office, 1989), constituting the most comprehensive study of classroom behaviour in the UK. It has not been replicated and hence, serves as a useful source of knowledge.

Figure 2.1:

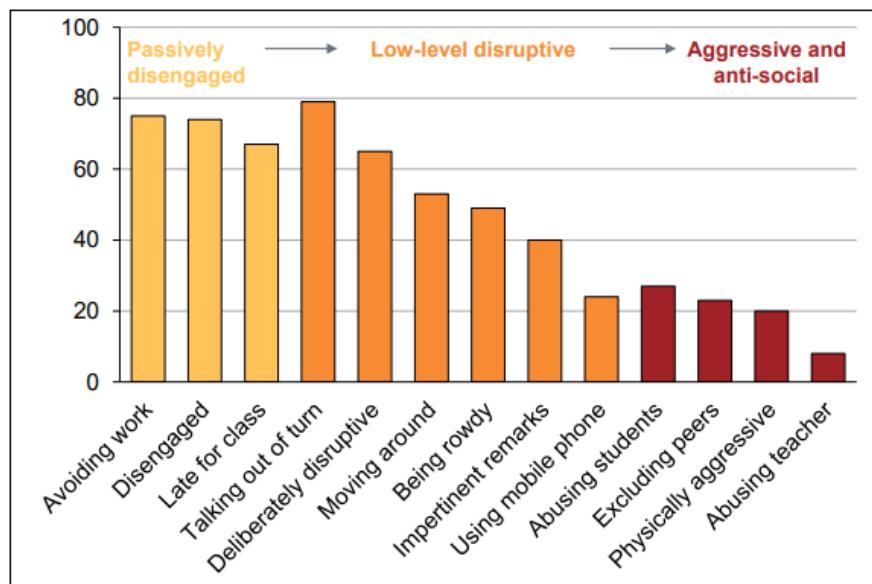
Types of pupil engagement in classroom learning (Sullivan et al., 2014)



Focusing on these aspects, Sullivan et al. (2014) identified various types of disengagement and disruptive behaviour (as shown in Figure 2.2), which were reported by the teachers every day.

Figure 2.2:

Percentage of teachers reporting disengagement and disruptive behaviour among pupils on a daily basis (Sullivan et al., 2014)



Passive disengagement issues, as shown in Figure 2.2 (reported by teachers), are mostly concerned with pupils' behavioural attitudes, for example, avoiding work, lacking discipline, and lacking motivation; these being the most common issues identified. However, issues of disruptive behaviour, such as interfering with other pupils, rude behaviour, moving around, and using mobile phones are the most common of all.

Aggressive and anti-social behaviour can be observed in instances where pupils are uncooperative and fail to comply with classroom norms. Such behaviour, consisting of the exclusion of peers, abuse of the teacher, and physical aggression is also regularly observed. Similar issues were identified in a study conducted by Gulay and Bayhan (2014), in Turkey, where pupils' behavioural issues were identified as being the main concern for teachers when attempting to engage them in learning.

Gaining control over pupils' disruptive behaviour will depend on the specific type of behaviour that they exhibit in the classroom, for instance, minor matters, such

as avoiding work or being late can be managed easily. However, more serious behaviour, such as intimidation and verbal abuse, are far more difficult to control (Gulay & Bayham, 2014). In a similar context, it was observed that in London alone, 35 pupils were expelled daily from schools; 54% of teaching assistants were found to have been physically abused or assaulted, and the number of temporary or fixed-period exclusions had risen from almost 303,000 in 2015 to just under 340,000 in 2016 in England, as a whole (O'Connell, 2017). Another important aspect of disruptive behaviour is that it can affect other pupils. In fact, peer misbehaviour can affect the entire class (Nash et al., 2015). Regarding which, a noisy environment will negatively affect the learning and focus of pupils who are actively engaged in the classroom. Conversely, good peer behaviour can positively influence other pupils (Nash et al., 2015).

O'Brennan et al. (2014) carried out some relevant research about the factors influencing pupils' classroom behaviour at the individual classroom and school levels. At the individual level, gender, ethnicity, prosocial behaviour were identified as important influences. At the classroom, level, class size and average classroom behaviour were identified. At the school-level, location and school climate were identified. Further research by Fielding-Wells and Makar (2008) revealed that critical subjects, of which mathematics is one, besides technical subjects may require special learning conditions and teaching practices. In the absence of the appropriate learning and teaching conditions, pupils can lose interest in learning about a subject, in particular, feeling that difficult subjects like mathematics are boring and irrelevant to them (ERO, 2016; Fielding-Wells & Makar, 2008). In one Malaysian study, Ayub et al. (2017) found that whilst, overall, pupils' engagement with mathematics was at a moderate level, that of girls was higher than for boys. Moreover, engagement was found to be higher in urban than in rural schools. The findings of these studies support the influencing factors (individual, classroom, school-level) identified by O'Brennan et al. (2014) as having a bearing upon pupils' classroom engagement.

Furthermore, it has been observed that pupils' lack of engagement, and disruptive behaviour can impact on the teacher's performance (Williams, 2018). In a recent survey conducted in the UK among 743 secondary school teachers, 1,051 parents, and 1,043 school pupils, it was found that 75% of the teachers had to deal with disruptive behaviour and had considered leaving the profession as a result

(Williams, 2018). More than 50% of these teachers believed that the quality of education was being affected by pupils' disruptive behaviour, and this was impacting negatively on their teaching practices (Williams, 2018). These findings from Williams' (2018) study reflect the seriousness of the problems associated with learning, in that they are negatively impacting on pupil development, the education system, and teachers' performance. Teachers are one of the main resources for minimising the impact of various influencing factors, as they interact directly with pupils and help them acquire learning strategies to help promote learning engagement. The next subsection discusses the importance and role of teachers in engaging pupils in the classroom and managing pupils' disruptive behaviour.

2.4.4. The teacher in pupils' engagement

Among the most important issues identified as being associated with learning engagement are approaches to teaching and learning. These emphasise the role of the teacher in engaging pupils in learning and managing disruptive behaviour (Christie & Emma, 2004; Debreli et al., 2019; Harford & MacRuaric, 2008; Stylianides & Ball, 2008; Uden et al., 2014; Zakaria et al., 2013). Teachers are the single most important drivers of how much pupils will learn in school (Miller, 2018; Saavendra, 2019). Blatchford et al. (2002) pointed out that smaller classes could provide more individualised teacher support for learning. In the context of large classes, these authors found that teaching strategies needed to be adapted according to class size, as it was a contextual factor that influenced both teachers and pupils (Blatchford et al., 2002). In addition, the role of institutions cannot be underestimated in terms of its influence on the learning environment. Therefore, it is important for educational institutions to focus on what teachers know, what they do in the classroom, how they teach, how they adopt their teaching practices to their pupils, etc. A consideration of these factors will ensure that quality education is provided, placing the right teacher in the right classroom.

As explained in the previous subsections, various learning and engagement issues associated with pupils relate to behavioural issues, which require special attention from teachers, whereby they modify their strategies according to pupils' behaviour and needs. Low-level disengagement and pupils' disruptive behaviour have been identified as the most challenging tasks for teachers (Sullivan et al., 2014).

Managing minor issues, such as being late for class, disrupting the lesson, making noise, playing with devices like laptops instead of paying attention, making impertinent remarks, moving around, etc. were classed as more challenging than unproductive behaviours, such as missing deadlines or making excuses about learning. Among the various approaches aimed at addressing disengagement and disruptive behaviour issues, teachers' decision-making is a key component (Debreli et al., 2019; Zakaria et al., 2018b), especially prior to lessons and while the lesson progresses. In addition, teachers encounter challenges in the classroom, with regard to engaging pupils, managing their behaviour, assessment, and delivering instruction effectively (Akkuzu, 2014). Teachers are not only required to possess adequate knowledge, for they must also be able to deliver such knowledge coherently and clearly, as well as resolving any issues that become apparent whilst teaching. According to Heward (2008), teachers should be recommended to apply measurement on a daily basis, so as to be able to make the right decisions when assessing their pupils' academic achievements. Teachers would then be able to collect the relevant information about their pupils' performance and behaviour from these daily measurements (Bushell & Baer, 1994). Consequently, their instruction would not be established based on their intuition, but rather, on solid data related to their pupils' behaviour. Hence, it is crucial that teachers design effective instruction and make clear decisions about the subsequent preparation steps. This will have a positive impact on aspects of academic engagement, such as the quality of pupils' work and their rate of progress (Kame'enui et al., 2002).

The type of interaction that occurs between pupils and their teacher can either have a positive or negative effect on pupils' behaviour and outcomes (Harford & MacRuaric, 2008; Uden et al., 2014). Teachers' way of interacting; with their pupils, their attitudes towards pupils, their styles of teaching are a few out of many factors that may affect pupils' responses to teachers (Gorard et al., 2016). Pianta et al. (2012) contend that pupil-teacher relationships and interactions consist of complex, multicomponent systems, the appreciation of which is fundamental to understanding pupil engagement. The features of positive pupil-teacher interaction include understanding, shared acceptance, affection, trust, respect, care, and cooperation (Krause et al., 2006). Moreover, many studies carried out in preschool settings highlight the impact of positive teacher-pupil interactions, and how such collaboration

can promote academic, social, and emotional aptitude, as well as readiness skills (Burchinal et al., 2016; Raver et al., 2011; Yoshikawa et al., 2013).

Aside from the above, Yasseen (2010) identified that positive interaction with the teacher improved pupils' engagement in classroom learning (Yasseen, 2010). Rashidi and Naderi (2012) conducted a study in Iran in which they observed that female teachers were highly supportive and interactive with pupils of both genders. Unlike female teachers, male teachers gave more compliments to pupils, and asked more questions. However, male pupils made jokes and interacted more frequently with the teachers of both genders, while female pupils were more formal and did not interact unless addressed by the teacher. These behavioural aspects could be related to social expectations. It may also be assumed that teacher-pupil interactions depend on socio-demographic factors, including gender, ethnicity, and culture. Thus, it could be deduced that there are various factors of influence on pupils' academic engagement and disruptive behaviour in the classroom. The following section outlines the conceptual framework considered in this study, limiting the scope of the various influencing factors being investigated.

2.5. Conceptual Framework

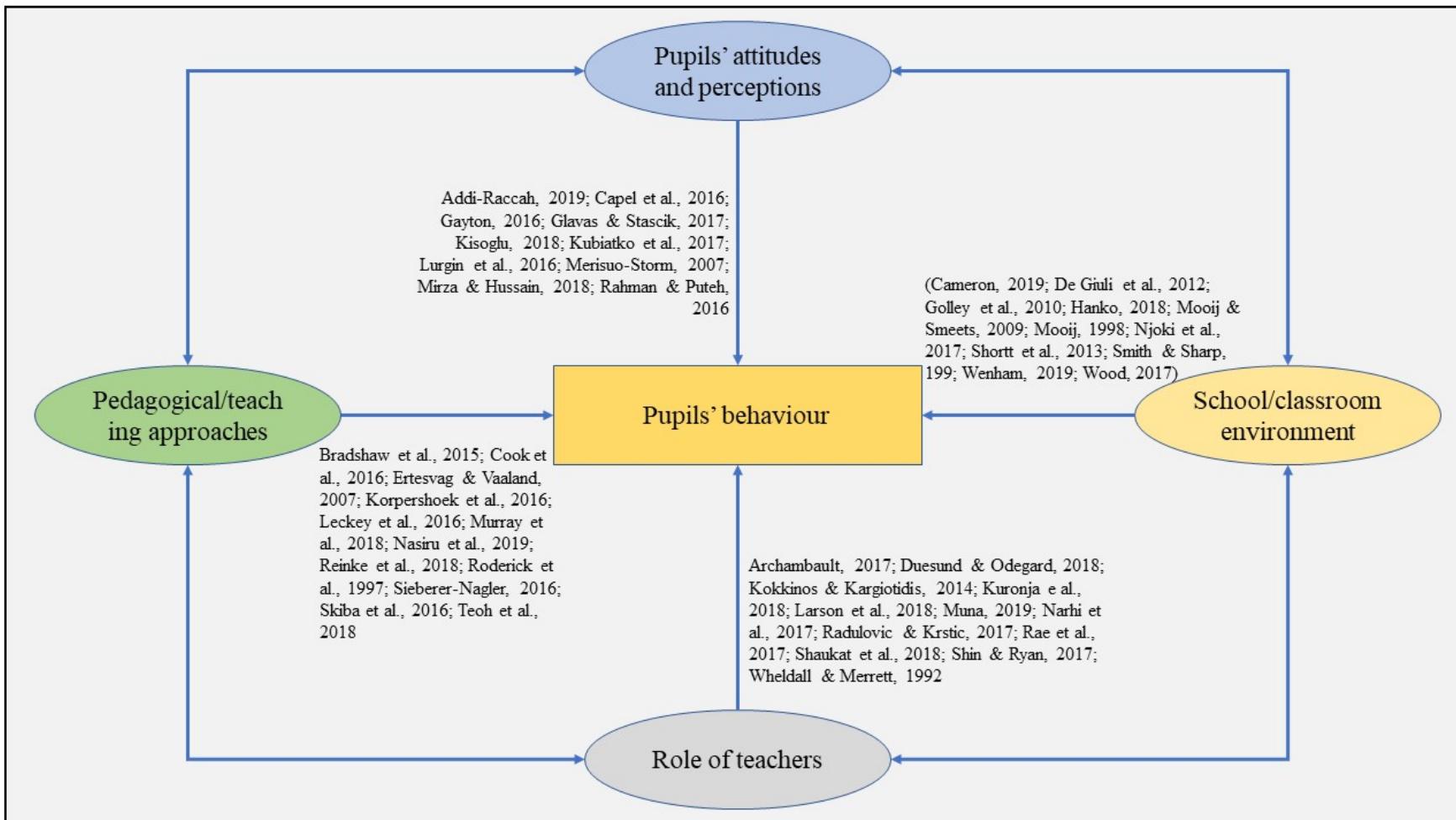
To identify the most effective approaches to managing academic engagement and disruptive behaviour in the classroom, as well as addressing the research questions in this study, the researcher developed a conceptual framework, interlinking various approaches (see Figure 2.3). This framework was designed to assess pupils' disruptive behaviour and academic engagement in relation to various factors of influence. It was constructed in light of the relevant literature relating to pupil behaviour and key influencing factors, being used to identify the most appropriate intervention for managing the academic engagement and disruptive behaviour of primary school pupils. However, factors such as pupils' background, home environment, and parental involvement were not considered in this study, as the focus was exclusively on the classroom environment.

Four framework components were created, following a review of the pertinent research literature, including: pupils' attitudes and perceptions, the school and classroom environment, the role of the teacher, and pedagogical approaches that affect pupils' classroom behaviour. These components, as well as the relationship between

them, are discussed in the following subsections, which explore the previous research on the components considered (as highlighted by supporting studies in Figure 2.3).

Figure 2.3:

Conceptual framework: Factors affecting pupils' behaviour in the classroom



2.5.1. Pupils' attitudes and perceptions

Pupils' personal attitudes and perceptions would appear to be more important than the classroom environment. There are various factors that affect pupils' motivation towards learning, including the school/classroom environment, peer behaviour, teachers, family background, and culture. Hence, analysing the relationship between pupils attitudes and academic performance are complex tasks (Capel et al., 2016). Whilst some pupils may have positive attitudes towards learning, others perceive it negatively. If pupils' experience negative attitudes to learning at home, they are likely to exhibit this attitude in school. Successfully improving pupils' academic engagement will depend on whether the teachers can engage those pupils and raise their level of interest (Reinke et al., 2007; Reinke et al., 2008).

The school ethos, classroom environment, teachers' attitudes, and teaching strategies are some of the important factors that can increase pupils' motivation to learn, thereby impacting on their behaviour (Capel et al., 2016). For example, if pupils feel that they are not valued at school, they may adopt an attitude where they devalue learning in that environment. Hence, even if pupils have a positive attitude towards learning, they may become demotivated, if the learning environment or teaching strategies do not stimulate their interest or meet their expectations. Therefore, it would seem that the aim of the teacher should be to focus on creating a motivational and supportive environment in the classroom. On their side, the school management should also be dedicated to creating a positive ethos and an enjoyable school environment, as this can increase pupils' interest in learning (Capel et al., 2016).

However, it is not just about the school environment, for there are other factors that can impact on pupils' attitudes to learning. For instance, interactions between pupils and private or home tutors can influence pupil-teacher interactions at school. Addi-Raccah (2019) investigated pupils' attitudes towards schoolteachers from two different perspectives: academic and socio-affective (non-academic) contributions of private teachers were enhanced. When the contributions of private teachers were analysed from an academic perspective, pupils' positive attitudes towards schoolteachers were more pronounced. However, when the contributions of private teachers were probed according to socio-affective aspects, criticism of schoolteachers increased. These differences in context may relate to the underlying ethos, discipline exercised, and practices adopted. If private tuition is based on a more socialised,

collaborative and friendly relationship between the teacher and pupil, and if the school environment differs from that pupils can develop negative attitudes towards school. Hence, it would appear appropriate to adopt collaborative, supportive, and friendly approaches to learning with pupils in schools, in order to minimise the impact of external approaches, such as private tuition.

Moreover, the influence of external factors can be minimised by socio-affective teaching practices (strategies that are non-academic in nature and involve stimulating learning by establishing a level of empathy between the instructor and pupil). Such practices can enhance pupils' attitudes to learning from a very young age. The importance of this for pupils' attitudes can be seen in a study conducted by Kubiak et al. (2017) in two different Czech schools (lower secondary and secondary schools), analysing pupils' attitudes to studying chemistry. While the girls achieved lower academic scores than the boys in secondary school, the latter achieved lower academic scores in lower secondary school, thereby highlighting the impact of socio-affective teaching practices on pupils. In addition, the study identified negative attitudes to learning chemistry among the pupils of both schools, and stressed the importance of developing positive attitudes to learning from an early age.

Mirza and Hussain (2018) ascertained that pupils' anxiety levels and attitudes are crucial to determining their learning engagement and performance. Their study highlights the need for effective teacher training and a support system, aimed at helping pupils to develop an interest in learning. It is also important to consider pupils' ability to learn when developing a motivational classroom environment. In this regard, Merisuo-Storm (2007) observed that pupils performed better in bilingual instruction (minimum of 20% of instruction given in English) than they did in monolingual classes. Pupils in bilingual classes, where their native language was the medium of instruction, exhibited more positive attitudes towards learning than in their monolingual classes, reflecting the pupils' attitudes towards the medium of instruction and its impact on their classroom engagement.

Hence, it can be deduced that teaching strategies should be designed according to pupils' attitudes to learning, thereby making the learning process easy, enjoyable, and engaging. Pupils who achieve lower academic scores may tend to disengage and have low levels of motivation for learning, whilst those who are actively engaged in effective learning are likely to have higher levels (Collier, 2015). Therefore, learning

strategies should not only focus on engaging pupils, but also on motivating them to learn and supporting improvement in their academic engagement by actively involving them in learning. Approaches, such as real-time feedback, regular assessment of pupils, and collaborative learning tasks can be effective in supporting pupils' active learning and engagement. This perspective is supported by Rahman and Puteh (2016), who determined that by adopting the GeoGebra Learning Module (GLM) for learning trigonometry, pupils' learning engagement improved. This attracted pupils to the self-access learning concept (pupils study independently, choosing from among various resources that are available). In addition, a greater increase in engagement and motivation was identified among the girls than the boys. Thus, it would seem reasonable to assume that teaching approaches/strategies can have varying degrees of impact on developing pupils' attitudes to learning.

Another issue relevant to pupils' attitudes and perceptions is managing academic engagement and disruptive behaviour in the classroom, where new tools are being introduced with the help of innovative technologies. Lurgin et al. (2016) provided one for learning classroom management, using real-time 3D virtual simulations in teacher training, with the aim of managing pupils' poor behaviour. Teaching methods that make use of technology were identified as having a greater impact on pupils' performance and engagement in learning, compared to traditional teaching methods. In addition, the pupils enjoyed learning with the use of technology. However, they did not believe that it would impact on their performance, thus reflecting their attitudes to using technologies in learning. In contrast, Glavas and Stascik (2017) found that when using escape room games as a technology intervention, pupils found it enjoyable to learn mathematics, and developed positive attitudes towards the subject. Therefore, the intervention techniques applied in the classroom should be effective in gaining pupils' interest and attention towards learning, whereupon it may be observed that pupils' attitudes to these interventions influence their behaviour (in terms of academic engagement and disruptive behaviour). Almutairi (2018) identified teacher training as an essential factor for improving pupils' engagement in the classroom. Moreover, Alghamdi and Higgins's (2015) study on primary school teachers in Jeddah revealed that training in both technical and pedagogical skills, as well as support from the school administration, is essential for the effective integration of whiteboards in the classroom. As an example, Alsulami (2016) investigated the use of iPads in Arabic language classes for year one pupils in

an Albushra primary school, finding that they led to an improvement in pupils' reading and cognitive skills. Similarly, a daily behaviour report card (DBRC) intervention, a procedure using academic engaged time (AET) (Alrumayh, 2018), and story-based teaching (Alotaibi et al., 2016) improved engagement and learning among pupils.

Additionally, the conceptual framework developed from the literature, as shown in Figure 2.3, reflects that pupils' attitudes may be linked to teaching strategies and the school/classroom environment, which can influence their attitudes to learning, thereby positively influencing their behaviour. Kisoglu's (2018) study highlights the importance of the classroom environment, teaching strategies, and the teacher's role in developing pupils' attitudes. The researcher analysed pupils' motivation and attitudes with regard to learning biology, and discovered that both intrinsic (self-development and learning) and extrinsic (classroom environment, teaching strategies, teacher's role) factors emerged as important in developing pupils' attitudes and behaviour to learning through active engagement.

The salience of teachers in learning and managing pupils' development may be understood in terms of their role in mediating the impact of pervasive attitudes and perceptions about learning, as well as their role in facilitating their development of positive conceptualisations of their future selves (Gayton, 2016). Therefore, in addition to teaching and learning interventions and the classroom environment, the role of the teacher may also affect pupils' attitudes and behavioural engagement towards learning. Hence, the teaching interventions adopted in the classroom must support positive classroom environments, actively engaging pupils and teachers in the teaching and learning process.

2.5.2. School/classroom environment

The second component of the framework (see Figure 2.3) for investigating pupils' disruptive behaviour and academic engagement focuses on the school/classroom environment, its influence on pupils' behaviour (specifically, academic engagement and disruptive behaviour), and engagement, in general. Schools can be considered as institutions where the organisational culture influences pupils' behaviour. The factors, including behaviour policy, school climate and communication, highly impact on this behaviour (Chaplain, 2003; Hanko, 2018; Short et al., 2013; Smith & Sharp, 1994; Wood, 2017). In addition, the classroom environment should provide the desired

conditions for learning and developing positive behaviour, as this can influence pupils' motivation towards learning, as well as how they value themselves and their education (Chaplain, 2003). Having a common staff policy on pupil behaviour to encourage consistency, effective rewards across the school, and a pleasant working environment, where pupils are encouraged to participate in school activities, have been identified as approaches that engender a supportive school/classroom environment (Hanko, 2018; Short et al., 2013; Smith & Sharp, 1994; Wood, 2017), which can facilitate academic engagement. Moreover, the school environment and culture, as affirmed by Spratt et al. (2006), should promote positive mental health, in relation to the pastoral care, discipline, and teacher/peer relationships that help develop positive behaviours among pupils in their learning and activities at school. Therefore, it may be understood that the policies that create a positive classroom environment, such as providing support, motivating pupils, and collaborative learning, can influence pupils' behaviour in the classroom by increasing their academic engagement and reducing their disruptive behaviour.

Several non-academic factors have been shown to play a part in affecting the school context with positive effects on behaviour. For instance, Golley et al. (2010) found that promoting the use of healthier school food and making changes to the dining environment in schools (guidelines provided by North Yorkshire Business and Education Partnership, 2004) essentially improved pupils' positive behaviour and attention to learning, whereupon they became more actively engaged (on-task and off task behaviour) with their learning and teachers. However, the authors stressed that this increased attention or alertness, raised by the intervention, should be channelled and supervised; otherwise, it could result in disruptive behaviour among pupils.

Non-academic interventions, such as friendly interactions with teachers, as identified by Mooij (1999), can develop pupils' prosocial behaviour by promoting the implementation of didactic rules in the school or classroom environment. To elaborate on this further, if pupils are encouraged to adopt ethics and discipline in their activities, such as standing in line, washing their hands before lunch, or cooperating with peers in learning activities, a sense of prosocial behaviour and discipline can be stimulated, thereby reducing bullying or disruption. In short, the behaviour outside the classroom can spill over into the classroom, manifesting as disruptive behaviour. Therefore, the classroom environment can be influenced by other activities within the school.

Correspondingly, Blatchford (1998) found that in order to combat the teasing and bullying that can occur at breaktimes, more supervision is necessary. However, the author opined that this supervision should be balanced, as breaktimes also provide opportunities for pupils to develop friendships, social competence, and a peer culture in the classroom. Similar to the positive environment outside the classroom, the environment within the classroom must be supportive and motivational, in order to increase pupils' academic engagement (De Giuli et al., 2012).

Learning facilitated in a comfortable environment can enhance pupils' satisfaction, thereby increasing their learning engagement and productivity (De Giuli et al., 2012). The school/classroom environment can greatly impact on pupils' psychological state, resulting in changes to their behaviour. De Giuli et al. (2012) conducted a study in seven primary schools in Italy, finding that classroom conditions depended strongly on teachers' decision-making. In some cases, poor air and noise quality (poor lighting conditions, closed windows, lack of sunlight) in the classroom negatively affected pupils' attention and engagement. Compared to the overall school environment, the classroom environment can have a much greater impact on pupils, given that they spend most of their time there while at school.

The relationship between the school environment and pupils' behavioural disorders can be clearly observed in the findings of Mooij and Smeets (2009), who recommend a systematic approach (defining instructional and classroom policies and approaches) to managing pupils' disruptive behaviour. Furthermore, classrooms managed by teachers with less positive teaching behaviour and poor facilities can result in disruptive behaviour among pupils (Mooij, 1998). The importance of the school environment, in addition to the classroom environment, is likewise highlighted in a study conducted in 12 primary schools in the Netherlands by Mooij and Smeets (2009). The findings revealed that all the schools lacked a coherent pedagogical-didactic structure or approach to integrating diagnoses (reviewing), special or mainstream curricular levels and materials, and reliable or valid evaluation of social learning results. Moreover, the above schools lacked a systematic approach to obtaining information from and collaborating with parents, other professionals, and/or external agencies. However, components such as a positive learning environment, assessment, and socio-behavioural support in the classroom have been found to result in increased engagement and enhanced academic performance (Njoki et al., 2017).

In contrast to supportive approaches, it would seem that strict practices are essential for managing pupils' classroom behaviour, but such practices may raise other issues that can impact negatively on learning. Wenham (2019) found that enforcing stricter classroom practices led to growing numbers of silent classrooms, caused by the fear of being 'put on the spot', shamed or humiliated. Therefore, the classroom environment should be largely based on support, fun, and engagement. That is, these elements should form the basis for managing pupils' disruptive behaviour, rather than imposing a silent classroom environment that detracts from pupil participation and learning engagement, potentially leading to serious psychological disorders (Wenham, 2019). Cameron (2019) recommends a number of initiatives, including developing a curriculum for individual pupils; teaching self-regulatory techniques; using mentoring and peer support; and enhancing intrinsic motivation, with the aim of improving the school and classroom environment, promoting classroom behaviour, and imposing school discipline.

The literature reviewed clearly reveals that the school and classroom environment can influence pupils' attitudes and perceptions towards learning, whilst in turn, impacting on pupils' behaviour in the classroom. The role of teachers and their teaching/pedagogical strategies are two other important factors that have bearing upon the school/classroom environment and pupils' classroom behaviour. An effective curriculum and appropriate teaching strategies can enhance pupils' motivation and satisfaction, thus increasing their learning engagement. Moreover, teachers are leaders in the classroom, with the responsibility of effectively implementing these strategies. As a result, they should be considered as the main facilitators of change in relation to managing pupils' behaviour in the classroom. Accordingly, the next subsection will examine the role of the teacher and their relationship with teaching strategies and pupils' behavioural management.

2.5.3. The teacher's role

The third component in the illustrated conceptual framework is the teacher's role in creating a positive classroom environment by adopting effective teaching strategies, and the subsequent influence of this role on pupils' behaviour, especially their academic engagement and disruptive actions. When teachers are directly involved in

interacting with pupils, they can adopt methods of managing their classroom behaviour, often based on their own learning and experience (Pressley et al., 2020).

The management of pupils' classroom behaviour is the responsibility of all stakeholders in the classroom, namely, teachers, teaching assistants, and classroom leaders. The teacher's behaviour is another important factor that determines whether pupils' classroom behaviour is effectively managed. Focusing on this aspect, Maulana et al. (2016) analysed the quality of teaching behaviour among pre-service teachers, as compared to that of experienced ones, according to factors such as class size and the teachers' gender displaying differences in the quality of this behaviour. With respect to classroom management, it was found that teachers' behaviour was mainly focused on academic engagement as a means of managing disruptive behaviour, rather than directly devising strategies for dealing with the latter. The authors identified academic engagement as an effective approach for improving pupils' academic performance and reducing disruptive behaviour.

The experience of practicum (training) can also reduce pre-service teachers' perceived stress (Kokkinos et al., 2016); when they are being trained in pedagogical approaches to deliver varying subject content, the opportunity to try these out during practicum can increase their confidence and reduce their stress levels. However, practicum is usually conducted only for a limited time in a small selection of schools. Therefore, it is possible that these trainee teachers might not fully experience pupils' disruptive behaviour. Moreover, the role of the teacher may have to be adapted to the type of such behaviour that is apparent in the classroom. In this regard, increased social intervention and the need to create awareness were identified as important teaching approaches in preventing violent digital behaviour (violence or disruptive behaviour resulting from the use of digital educational tools, such as games) (Radulovic & Krstic, 2017).

Social intervention and the adoption of other strategies, like raising awareness of moral conduct, can form part of managing pupils' disruptive behaviour, in addition to academic engagement approaches. Moreover, supervision is another approach adopted by teachers to manage pupils with disruptive behaviour. This is one of the most common approaches adopted, whereby teachers observe pupils' behaviour in the classroom and react differently to those exhibiting disruptive behaviour. However, Rae et al. (2017) found a lack of consistency and understanding in teachers'

supervision of pupils, as they tended to apply different solutions, according to their own training and professional experience.

Issues such as disruptive behaviour can greatly affect how teachers deliver instruction and the effectiveness of that delivery, but there is a lack of research analysing the teacher's role in managing disruptive behaviour. Kambuga (2017) analysed disruptive behaviour in terms of discipline problems, categorising these into minor ones (noisy classrooms, coming late to school, lack of proper school uniform, bullying, lying, sleeping in the classroom during lessons, provoking prefects) and major disciplinary ones (physical fighting, threatening teachers, drug use, use of mobile phones). Both major and minor discipline problems can directly affect teachers and their teaching practices. Pupils' disruptive behaviour leads to the loss of instructional time, resulting in an inability to deliver the complete curriculum and potentially affecting other pupils' learning (Muna, 2019). It not only increases stress among teachers, but also, adds to their workload. Kokkinos and Kargiotidis (2014) observed the need to consider the role of teachers' individual characteristics when looking at pupils' problem behaviour. The authors found that most of the literature was focused on pupils' behavioural issues and only a few took into account teachers' individual characteristics (resulting from coping with behavioural issues in the classroom), such as stress, burnout and workload, especially in relation to the management of disruptive behaviour.

The diversity identified in teachers' and pupils' perceptions of disruptive behaviour reflects the complexity of the problem. In this context, Duesund and Odegard (2018) analysed the classroom environment, as well as pupils' and teachers' perceptions in Norwegian and American schools. They found that the pupils' reactions indicated a tendency to escalate disruptive behaviour, while teachers generally strove to reduce it. The above study also revealed pupils' perceptions and reactions regarding disruptive behaviour, which can be challenging for teachers to change. In this context, Kuronja et al. (2018) analysed teachers' sense of efficacy in managing pupils with learning, emotional, and behavioural difficulties. The study deduced that mainstream teachers perceived higher self-efficacy in their ability to manage pupils' learning and behavioural problems, focusing mainly on improving academic engagement. Whereas, specialist teachers reported higher efficacy in aspects of their pupils' engagement and comprehension of the learning material, as well as of managing

pupils' disruptive behaviour. This would imply that mainstream teachers could well need special training to manage disruptive behaviour effectively in the classroom.

Teachers' perceptions of how they can control disruptive behaviour can vary and therefore, different strategies must be adopted to tackle the problem (Nash et al., 2015). As a result, pupils may be exposed to different approaches by different teachers, and may not be able to cope with these, thus resulting in further escalation of disruptive behaviour (Nash et al., 2015). Hence, there is a need to adopt a commonly agreed approach among teachers (one that is easy to implement, and that actively engages pupils in learning) for the management of pupils' disruptive behaviour in the classroom. In addition, incorporating collaborative participation and the active involvement of pupils and teachers could help build healthy, effective pupil-teacher relationships (Archambault, 2017). In Archambault's (2017) study, it was found that pupils with high levels of oppositional behaviour reflected lower behavioural engagement than their peers who had close relationships with their teachers and displayed higher levels. Thus, positive relationships between pupils and teachers can help manage disruptive behaviour. Conversely, Shin and Ryan (2017) evinced that pupils may tend to become like others exhibiting disruptive behaviour in classes, where there is low emotional support from the teacher, compared to classes with high teacher support.

Consequently, teachers need to build strong relationships with their pupils when seeking to manage disruptive behaviour. In light of this, teachers' cooperation in collectively agreeing on behavioural expectations, use of positive feedback, and development of strategies, were identified as effective for managing disruptive behaviour among pupils (Narhi et al., 2017). Larson et al. (2018) determined that culturally responsive teaching could lead to positive pupil behaviour in the classroom. That is, by modifying their teaching strategies to suit the culture and traditions of the pupils' background, teachers could help improve the engagement of those pupils in their learning, thereby reducing disruptive behaviour (Larson et al., 2018).

In addition to teachers' roles and abilities, appropriate pedagogical/teaching strategies are considered to be effective tools for those seeking to manage academic engagement and disruptive behaviour among pupils, and these are explored in the next subsection.

2.5.4. Pedagogical/teaching approaches

Teaching approaches are considered as the fourth main component in the proposed conceptual framework (illustrated in Figure 2.3), as they influence pupils' behaviour (especially their academic engagement and disruptive behaviour) in the classroom. All countries usually have a national curriculum, reflecting the educational content and courses that need to be taught (Green, 2019; Renato et al., 2018). These curricula may be common to the whole of the country concerned, but in some cases, they can differ from region to region. For example, in India, there is a national curriculum and a board of primary and secondary education, governed by the Central Board of Secondary Education (CBSE). In addition, there are different curricula prepared by state boards, which differ in the content taught (Batra, 2015; National Counsel for Educational Research and Training, 2006).

It should be understood that curriculum design is influenced by cultural factors from the surrounding society and geographical region. Moreover, the way in which this curriculum is to be taught should also be considered, rather than merely the content of what needs to be taught. Regarding which, in some countries, such as the England (Loughran & Russel, 1997; The National Strategies, 1997-2011), teachers are told *how* to teach, while in others, like India, teachers have independence in selecting their own teaching approaches (National Counsel for Educational Research and Training, 2016; Sengupta, 2016). However, regardless of the context, teachers always have at least some degree of freedom to select their teaching strategies, which can be adopted according to the pupils' needs, engagement, and learning behaviour.

To some extent, the approaches applied by teachers to manage disruptive behaviour will depend on whether they regard the cause of the behaviour as lying outside the sphere of the school's control (i.e., families, the wider society) or within it (i.e., the classroom, school environment). Approaches need to be developed by teachers in consideration of the causes of disruptive behaviour, which can help identify the root cause of problems and devise effective solutions. Accordingly, Tattum (1989) identified three different types of approach, under which various modern approaches can be categorised (Maher et al., 2014). These approaches are still considered in recent studies (Fiedler, 2020; Hugh-Jones et al., 2020) and are described in detail below.

The crisis management approach is a reactive one, aimed at seeking the cause and cure for a problem within the sphere of the pupils' individual psychology (Frude, 1984). It is also referred to as the 'medical model', which leads to it being addressed analytically. That is, disruptive behaviour is considered as an illness, manifesting itself in symptoms for which appropriate treatment must be prescribed. Meanwhile, interventionist approaches are relative, being focused on the context and interaction required to address the problem of disruptive behaviour. They involve adopting a problem-solving model: problem specification, data collection, objective setting, intervention, and evaluation (Topping, 1986). The objective is to work with a school or other institution to initiate change. These approaches consider the factors at play and the pupils' needs in understanding the situation, with the aim of an intervention that leads to the construction of more effective relationships and structures.

In contrast, preventive (whole school) approaches pertain to developing structures and processes that are geared towards reducing problems and anticipating crises within schools (Tattum, 1989). Approaches, such as a common staff policy, positive teacher attitudes towards pupils, and the use of rewards and punishments may be considered preventive. These approaches can be aligned with interventions to engage pupils in learning, reduce their disruptive behaviour, and increase their academic engagement.

The crisis management approach considers the problem of disruptive behaviour from the perspective of a mental condition, whereupon medical treatments are usually used to address the problem (Frude, 1984). Conversely, preventive approaches address the problem at the institutional (school) level, where strategies are adopted to prevent the problem from arising in the first place (Tattum, 1989). Therefore, an intervention would appear to be more beneficial for addressing disruptive behaviour. That said, an intervention for managing pupils' disruptive behaviour should be effective, as it must not only reduce disruptive behaviour, but also, improve academic engagement. Moreover, intervention techniques need to incorporate strategies for achieving positive results.

In this context, Vijayan et al. (2016) examined teaching approaches by conducting observations in kindergartens and proposing strategies for managing classroom behaviour, which included: 1) Encouraging and reinforcing positive behaviours: praising a pupil when positive behaviour is exhibited. Such practices

motivate pupils to adopt more positive behaviours, as their efforts are recognised and lauded. 2) Planning to ignore negative behaviours: this approach is most often used with younger pupils, whereby attention is not given to them, despite their craving it. As a result, the pupil realises that such behaviour does not attract attention and accordingly, stops practising it. 3) Redirecting the pupil: pupils can be redirected to another activity when they exhibit destructive behaviour. For example, if pupils are playing in a sandpit area and some are throwing sand at others, they may be asked to leave and play elsewhere, after explaining to them why they are being redirected. 4) Distracting the pupils: given that they can be easily distracted, teachers often use this strategy to regain their attention, thereby reengaging them with the learning. 5) Adjusting the classroom environment: changing the classroom theme in relation to the class/lesson being taught can actively engage pupils in learning. In addition, adjusting the classroom schedule according to the pupils' needs and providing breaks are some of the other approaches that have been identified.

As disruptive behaviour can be observed among pupils of different ages, diverse approaches can be adopted to manage such behaviour for different age groups. Teaching practices should be focused on increasing pupils' motivation for learning by assessing and fulfilling pupils' basic psychological needs (Granero-Gallegos et al., 2019). Motivated pupils are more likely to focus on learning and reflect positive behaviour in the classroom, while demotivated ones can engage in disruptive behaviour and disengage from learning (Granero-Gallegos et al., 2019). Focusing on this concept, Granero-Gallegos et al. (2019) analysed the effect of perceived teaching competence, motivation, and basic psychological needs on disruptive behaviour. Their findings revealed that this type of behaviour was more prevalent among male pupils and was less so when pupils perceived their teacher as being competent. In addition, pupils who were self-motivated and determined, exhibited high levels of academic engagement and low levels of disruptive behaviour, whereas those who were demotivated, exhibited high levels of such behaviour in class. Additionally, Granero-Gallegos et al. (2019) proposed that teachers should adapt their approach to pupils' interests and needs, which could increase their self-determined motivation (motivation without external influence or interference). Self-determined or intrinsic motivation can promote pupils' active academic engagement and thus, the interventions used to reduce disruptive behaviour should be aimed at increasing such motivation for learning (Skinner et al., 2012). Various approaches are adopted by teachers in different

classroom settings, which may be based on their experience or derived from their training programmes (Hickey et al., 2015).

As noted, the key issue in this present study consists of teachers and school managers being able to identify effective teaching approaches for managing pupils' disruptive behaviour in the classroom. These practices are often derived from components of the setting, including the ethos underpinning the culture and management of the school, as well as the teacher's abilities (Vijayan et al., 2016). Clearly, teachers' approaches to classroom teaching are greatly influenced by the training that they have received as pre-service teachers on a teaching programme (Hickey et al., 2015). When investigating the impact of the teaching curriculum on pre-service teachers, Flower et al. (2016) observed that pre-service teachers were more likely to be taught using universal management strategies, rather than focusing on specific strategies for managing different types of disruptive behaviour in the classroom. Moreover, many differences were observed across teacher certification programmes. Notably, the above researchers identified a lack of input managing pupils' disruptive behaviour on many programmes of this kind. This is considered to be one of the main problems, whereby pre-service teachers may find it stressful and become demotivated in the process of managing disruptive behaviour in the classroom, after joining a school as a mainstream teacher. This not only impacts on teachers who are new to the profession, for very often, even experienced teachers can find it difficult to manage disruptive behaviour.

Given the importance of developing teachers' competences, Hickey et al. (2015) analysed the impact of a classroom management training programme on improving these competences. A great improvement in classroom behaviour was reported by the teachers after taking this classroom management training programme. In addition, the cost of the training programme was moderate, consequently making it easy to access and implement. In addition, when investigating the pupil-teacher relationship, McGrath et al. (2017) used pupils' drawings of themselves with their teachers to discover their perceptions of the teacher-pupil relationship. Notably, the findings revealed that the boys depicted a more positive relationship than the girls with their teachers. Such approaches can help teachers understand pupils' attitudes and behavioural patterns, according to which they may have adapted their teaching strategies. Furthermore, teacher training programmes (Leckey et al., 2016; Teoh et al.,

2018) for managing pupils' behavioural issues have been proposed as being highly effective in increasing teachers' abilities, competence, and awareness of new prosocial and preventive approaches.

A recent study conducted by Stanforth and Rose (2018) revealed that behaviour problems among pupils in UK schools have been increasing, and that both teachers and pupils blame each other for this phenomenon. Nevertheless, teachers have demonstrated a willingness to change their teaching practices and use a contextual approach to understanding pupils' behaviour. That is, they reported feeling the need to understand the backgrounds and home life of their pupils, in order to be able to tackle disruptive behaviour effectively. Hence, teachers may consider changing their strategies according to pupils' basic needs. In a study conducted in Finland with ADHD pupils, they gave negative opinions of their teachers' classroom management strategies and justified these negative reactions based on the teachers' conduct (Honkasilta et al., 2016). Nevertheless, these studies would appear to relate to contexts where teachers have poor teaching strategies for managing classroom behaviour.

Vaaland and Serpa (2017) categorised teaching strategies for the effective management of disruptive behaviour in the classroom into two types: cognitive and systems. A cognitive strategy is concerned with pupils' behaviour and attitudes, which involves creating awareness among them of preferred learning environments, and training them in the skills required to behave in accordance with the chosen standards. A systems strategy, on the other hand, relates to the class as a social system led by the teacher. Hence, establishing authority implies the power exerted by teachers, and success in managing disruptive behaviour depends on the effective use of social dynamics and leadership practices. Accordingly, teaching strategies can be developed in different contexts, thereby effectively managing disruptive behaviour in the classroom.

A meta-analysis of 54 studies on the effects of classroom management strategies and programmes on pupils' academic, behavioural, emotional, and motivational outcomes found that interventions (teaching approaches) aimed at managing classroom behaviour were mainly concerned with pupils' social-emotional development (Korpershoek et al., 2016). Successful teaching approaches were recommended as having fun, engaging, and in particular, being geared towards

emotionally connecting pupils with active collaborative learning activities, thereby fostering supportive relationships with teachers (Korpershoek et al., 2016).

A change in the behavioural management strategies adopted by teachers has been observed in recent years. Nasiru et al. (2019) explored the behavioural management strategies of 50 teachers in 10 schools in Thailand. It emerged that non-aversive behavioural management strategies (for example, non-punitive: using the carrot instead of the stick) were the most widely used strategies among Thai teachers. There was also evidence of these being more effective than other measures, such as punitive strategies. The adoption of behavioural management strategies indicates a transition from punitive and reactive approaches to instructional and preventive ones for managing disruptive behaviour in the classroom, with social and emotional relationships forming a strong foundation. Accordingly, Skiba et al. (2016) stressed the need for a social curriculum, where classroom management is implemented through behavioural instruction, focused on setting clear expectations and establishing an appropriate curriculum, which can increase pupil engagement, positive acknowledgment, and strong relationships between them and their teachers.

Studies focusing on universal behavioural management programmes for teachers are increasing, and many approaches have been found to be effective, for instance, the Incredible Years Teacher Classroom Management (IY TCM) Programme. This is a collaborative, reflective, problem-solving, and experiential teaching practice approach, with the aim of fostering socio-emotional competence in pupils by reinforcing teacher-classroom management strategies and relationships, as has been reviewed in different studies (Murray et al., 2018; Reinke et al., 2018). It was found to be successful in managing pupils' classroom behaviour; their prosocial behaviour and social competence were improved, and their emotional dysregulation reduced. In addition, the pupils' academic competence was enhanced. Similarly, studies on positive teaching strategies have also reflected beneficial outcomes in relation to pupils' behavioural management. For instance, in research by Cook et al. (2016), teachers were supposed to deliver specific praise, approval statements, and positive non-verbal gestures to pupils exhibiting unacceptable behaviour or to the entire class every five minutes during their classroom teaching. As a result, reduced disruptive behaviour and increased academic engagement were observed in the classroom.

However, Ertesvag and Vaaland (2007) stated that most behavioural management approaches have been centred on addressing just one type of problem behaviour. In order to address different types, Ertesvag and Vaaland (2007) proposed the 'Respect Programme' intervention as an ideal solution. This requires all the teachers and pupils to exercise discipline and show respect for learning, teaching, and other constructive activities. As asserted by these authors, this programme could be effective in addressing different types of behavioural problem. Accordingly, the intervention was implemented and found to be successful in addressing various behavioural issues, such as off-task behaviour, misbehaviour with peers and teachers, talking during lessons, etc. Nevertheless, differences in impact were observed with respect to different years and genders.

With an emphasis on a preventive strategy, Bradshaw et al. (2015) analysed the impact of School-Wide Positive Behavioural Interventions and Support (SWPBIS) in preventing disruptive behaviour and improving the school environment. These interventions involve adopting empirically supported practices, such as active learning approaches, and gathering data to monitor effective and equitable implementation and guide decision-making. The data in the aforementioned study were collected from 37 primary schools with 12,344 pupils. Latent Profile Analysis of the data identified four categories: high-risk (6.6%), at-risk (23.3%), normative (36.5%), and socially-emotionally skilled (33.6%). The study elicited that the SWPBIS effects were greatest amongst at-risk and high-risk pupils. Similarly, Glynn et al. (2010) used a preventive strategy, namely, correspondence training to reduce pupils' troublesome behaviour. Two types of misbehaviour – talking out of turn (TOOT) and hindering other pupils (HOC) – were targeted by the intervention. In addition, rewards were provided to reinforce the behaviour of pupils who exhibited a drop in their troublesome behaviour. The findings revealed a high reduction in disruptive behaviour and an increase in academic engagement. Roderick et al. (1997) applied a similar rewards approach, but in relation to behaviour in the school playground, where the scope of misbehaviour, bullying, and teasing was far reaching. The pupils' exhibiting good playground behaviour were rewarded with raffle tickets at lunchtime, with the draw being held every week and prizes distributed accordingly. This rewards approach was found to be effective in reducing the disruptive behaviour of pupils in the playground. In sum, evidence has found that intervention-based approaches based on active learning

strategies can be more effective in managing academic engagement and disruptive behaviour than other approaches, such as preventive strategies.

A review of the literature on teaching practices revealed that pro-social strategies and socio-emotional relationships are more effective than traditional ones, where reactive and punitive approaches are applied. These pro-social strategies focus on improving the relationship among pupils and teachers through collaborative learning. Positive relationships between the two can contribute to a classroom environment that is conducive to learning, thereby influencing pupils' attitudes to learning and actively engaging them in learning-related activities. The proposed framework was used to identify the most appropriate intervention for managing pupils' academic engagement and disruptive behaviour in primary schools. Active learning approaches in this context can be regarded as being most applicable, as they pertain to improving pupil-teacher relationships, pupils' attitudes (motivation), the classroom environment, and the active engagement of pupils and teachers in learning (Iqbal et al., 2017; Nissim et al., 2016). In order to identify the most effective intervention (active and collaborative) for the Saudi context, a review of the relevant literature was conducted for the present study. With this in view, the next section will explore the effectiveness of active learning approaches as an intervention for managing pupils' disruptive behaviour in the classroom.

2.6. Active Learning: An Approach to Managing Disruptive Behaviour and Academic Engagement

An active learning process pertains to engaging pupils in various learning activities, such as role play, discussions, feedback, etc. This places a greater degree of responsibility on learners than on teachers, but both are engaged in the process. Learners are engaged in various knowledge-building activities, while teachers are involved in teaching, coordinating, and assessing the learning process and development. As evident in the literature, active learning can support pupils' academic engagement and address disruptive behaviour in various ways, such as increasing motivation and gaining pupils' attention; helping them to self-review the concepts taught (Iqbal et al., 2017); assessing their prior knowledge; determining whether they have understood the materials and concepts (Haydon & Kroeger, 2015); promoting problem-solving and deepening their capacity to understand; and supporting those

with anxiety disorders through active and collaborative engagement (Nissim et al., 2016).

The following subsection reviews various studies that have focused on active learning techniques for managing disruptive behaviour and academic engagement. It also analyses various active learning techniques in terms of their complexity, cost of implementation, and applicability in the Saudi context.

2.6.1. Review of active learning approaches in managing disruptive behaviour

As explained in subsection 2.4.4, there are various teaching strategies for managing disruptive behaviour among pupils. Here, the focus is on collaborative or cooperative approaches, which seek to engage pupils and teachers in various learning activities. It is understood that cooperative learning is always active learning, but not all active learning is cooperative (Keyser, 2000). In reference to these approaches, it is essential to adopt techniques that will encourage pupils to become actively involved. With this perspective, McNamara (1992) observed that the motivational interviewing technique (an approach that combines elements of the non-directive humanistic model of counselling with a more behaviourally oriented one) can be effective in enhancing pupils' abilities and self-motivation. That is, it instils motivational behaviour in pupils and engages them in learning, which can result in positive attitudes among them towards learning. This is one of the key components of the conceptual framework in this study (see Figure 2.3). Similarly, with regard to the approaches that can influence pupils' attitudes to learning, Bruhn et al. (2016) evinced that goal-setting strategies are effective in engendering the academic engagement of pupils in their learning and reducing their disruptive behaviour.

Active learning approaches should involve collaboration by both teachers and pupils in their learning, which not only builds strong relationships, but also, promotes competence, satisfaction, and motivation for both parties (Le et al., 2017). Against this backdrop, Kaplan et al. (2010) used a goal-based strategy (setting learning goals within a stipulated timeframe and using collaborative techniques to achieve them), involving both teachers and pupils. The findings revealed that the pupils' personal mastery goals (having the right mental attitude to make decisions and take action) resulted in lower levels of disruptive behaviour, whilst performance avoidance ones resulted in higher levels of such behaviour (Kaplan et al., 2010). In addition, the

teachers reported a goal-based strategy as having a moderate effect on managing disruptive behaviour in the classroom. Therefore, goal-based strategies were identified as effective in improving pupils' attitudes, the role of teachers, and the learning process – these being considered as the main components of the current conceptual framework. However, varying skill-levels among pupils can negatively impact on the effectiveness of goal-based strategies in delivering positive outcomes. Young-Pelton and Bushman (2014) applied a self-modelling video-based approach. The pupils were video-recorded during their learning tasks and the recorded video was shown before the next task, where they could realise their behavioural difficulties and accordingly, improve their behaviour and active learning in the classroom. This approach was found to be effective in that the pupils were made to acknowledge their behaviour, with the change being initiated from themselves, rather than through the teacher's instruction, which increased their intrinsic motivation and resulted in higher levels of engagement.

Moreover, Fernie and Cubeddu (2016) investigated the effect of the Working on What Works (WOWW) approach on enhancing classroom relationships and behaviour. Using this approach, the classroom sessions (teachers and pupils) were observed by a coach, who later provided feedback aimed at improving the classroom behaviour of both teachers and pupils. This collaborative approach included the teacher, pupils, and a coach or observer all working together to improve classroom behaviour. In Fernie and Cubeddu's (2016) study, both teachers and pupils reported positive experiences of using WOWW and an improvement in classroom behaviour was also observed. However, the involvement of an observer may not always be a feasible approach in regular classroom teaching, as it can impact on teaching and learning behaviour. Moreover, an effective behaviour management approach is one where the pupils are involved in developing their own behaviour and engagement.

Regarding large scale interventions, Nelson et al. (2002) investigated the impact of a comprehensive, whole-school intervention (preventive), involving a discipline programme, one-to-one tutoring, conflict resolution, a video-based family management programme (using multi-media interventions, such as creating videos and involving pupils' families in developing behavioural engagement towards learning), and an individual, function-based intervention plan. The study revealed positive effects on social adjustment and improved academic performance. It should

be noted that the intervention involved cooperative and collaborative strategies, with the inclusion of families, pupils, teachers, and school management. An individual tutoring and behavioural management plan should be based on assessing basic needs and appropriate strategies for fulfilling learning objectives (Nelson et al., 2002). Similar views were held by Cooper and Upton (1991) and Gatongi (2007), who deduced that pupils' needs should be given priority when addressing behavioural problems. An approach that considers pupils' needs, while also supporting collaborative learning, may be effective in managing academic engagement and disruptive behaviour.

Active learning approaches can, therefore, be applied in different contexts, target pupils' needs, and consider the different stakeholders when devising intervention strategies. Some of the main approaches identified in different studies using active learning approaches for managing academic engagement and disruptive behaviour are presented in Table 2.1. These approaches are compared and analysed to identify the appropriate intervention for reducing disruptive behaviour and improving academic engagement among pupils. Factors, such as the type of intervention, sample population, intervention's complexity, implementation costs (assessed from the characteristics of implementation and resources required, as indicated in the relevant studies), and outcomes are considered in the studies outlined in Table 2.1. These factors are taken into account to determine the appropriate intervention that is cost-effective, easy to use and implement as well as involving active learning techniques. Studies focusing on active learning approaches focusing on pupils of different age groups were considered in the review, as these may be applicable to primary school pupils. There is a lack of research on the specific management of academic engagement and disruptive behaviour among primary school pupils using active learning techniques. As a result, studies that focus exclusively on active learning techniques over a wider sample (pupils) and subjects were also included to evaluate the relevant techniques, and their applicability to primary school pupils.

As identified in Table 2.1, the study conducted by Unamba et al. (2006) assessed the impact of an active learning approach (flipped classrooms: where the activities that have traditionally taken place in the classroom are carried out outside of it) on academic engagement in learning algebra. Specifically, a questionnaire-based survey was implemented as the data collection method, with 85 primary school pupils in

Nigeria, aimed at analysing the impact of the flipped classroom approach on pupils' engagement. It was ascertained that behavioural, emotional, and cognitive engagement promote active learning. Moreover, there were no differences observed between male and female pupils or rural and urban pupils, thus reflecting the applicability of the approach across a wider population. It was concluded that the flipped classroom can be effective in improving academic engagement, but it might not be applicable in the context of Saudi Arabia, given the prevailing conservative views and embedded learning styles.

Similarly, Chen and Su (2018) conducted a study on flipped learning, where the pupils were tasked with generating instant questions, to which the flipped learning system provided immediate feedback. Survey questionnaires were used to collect data from 54 undergraduate pupils at Zhejiang University in China. When adopting a flipped learning approach, the pupils' doubts were constantly addressed, which appeared to increase their engagement in learning. The instant response system was found to have a positive impact on pupils' engagement, but did not influence their motivation or attitudes towards learning, which was in contrast to Unamba et al. (2006) study's findings. Hence, it may be concluded that the flipped classroom and other learning approaches would appear to have varying degrees of impact on different populations and ages.

Table 2.1:*Summary of studies adopting active learning approaches for managing disruptive behaviour and academic engagement*

Authors	Study Overview	Methods	Sample	Intervention	Measures	Cost of Intervention	Complexity of Intervention	Additional Training	Study Outcomes
Aggarwal (2018)	Assessing the impact of a student response system on academic participation and disruptive behaviour	Observation and survey	14 college students	Student response system	Disruptive behaviour and academic participation	High	High	Yes	Big reduction in disruptive behaviour, increase in academic response and participation
Aspiranti et al. (2018)	Assessing the impact of a colour wheel system on pupil behaviour	Observation and survey	20 second year pupils and 20 third year pupils	Colour wheel system	Disruptive behaviour	Medium	Medium	Yes	Big decrease in disruptive behaviour and a high level of acceptance of the colour wheel system by teachers
Chen & Su (2018)	Assessing the impact of flipped learning on pupils' learning motivation, attitudes and engagement	Questionnaires	54 high school pupils	Flipped learning	Motivation, attitudes and engagement	Low	Low	Yes	Positive impact on pupils' learning motivation, attitudes and engagement
Dewitt & McLuskie (2019)	Assessing the impact of a jigsaw technique on knowledge retention and students' engagement	Questionnaires	36 BA Enterprise and Entrepreneurship students	Jigsaw method	Engagement and knowledge retention	Low	Medium	Yes	Increased academic engagement and student performance. Improved knowledge retention
Duchaine et al. (2018)	Assessing the impact of response cards on pupil engagement, academic achievement and disruptive behaviour	Observations and survey	Three primary school pupils with challenging behaviour and three primary school pupils without any such difficulties	Response cards	Engagement, academic achievement and disruptive behaviour	Low	Low	No	Increased academic achievement and pupil engagement; big reduction in disruptive behaviour
Lambert et al. (2006)	Assessing the impact of response cards on pupils' disruptive behaviour and academic participation	Observation	Nine 4th year pupils	Response cards	Disruptive behaviour and academic participation	Low	Low	No	Big reduction in disruptive behaviour; increase in academic responding and participation

Authors	Study Overview	Methods	Sample	Intervention	Measures	Cost of Intervention	Complexity of Intervention	Additional Training	Study Outcomes
Lynch & Keenan (2018)	Assessing the impact of a good behaviour game on controlling disruptive behaviour in the classroom	Observations	20 primary school pupils	Game-based learning	Engagement and disruptive behaviour	Low	Medium	Yes	Much reduction in disruptive behaviour in the classroom
Marquez et al. (2017)	Assessing the impact of a jigsaw method on pupils' attitudes and engagement towards learning	Questionnaires	28 pre-university pupils	Jigsaw method	Attitudes, learnability and engagement	Low	Medium	Yes	Improved engagement and attitudes towards learning among the pupils
Paulish (2018)	Assessing the impact of response cards on disruptive behaviour and academic engagement	Observation and survey	Three 2nd year pupils with challenging behaviour	Response cards	Engagement, academic achievement and disruptive behaviour	Low	Low	Yes	Increased academic achievement and pupil engagement; big reduction in disruptive behaviour; strong acceptance of response cards by pupils and teachers
Przybylski & Mishkin (2016)	Assessing the impact of electronic games on pupils' behaviour, hyperactivity, emotions, and academic engagement	Questionnaires	271 primary school pupils	Game based learning	Engagement, hyperactivity, behavioural issues and academic achievement	High	Medium	Yes	Improved engagement and performance; reduced hyperactivity
Rubow et al. (2018)	Assessing the impact of a good behaviour game on pupil and teacher behaviour	Observations and survey	49 primary school pupils	Game based learning	Engagement and disruptive behaviour	Low	Medium	Yes	Reduction in disruptive behaviour in the classroom. Strong approval from both pupils and teachers
Ruiz-Olivares et al. (2010)	Assessing the impact of an integrated approach using a good behaviour game and say-do reports on pupils' behaviour	Observation and survey	15 pupils at a primary school	Game-based learning and activity-based learning	Disruptive behaviour	Medium	Medium	Yes	Big decrease in disruptive behaviour in the classroom
Stowell & Nelson (2007)	Assessing the impact of a pupil response system on pupils' academic participation	Observation and survey	35 pupils in each of the four groups (n=140)	Pupil response system	Academic participation	High	High	Yes	Big increase in academic participation

Authors	Study Overview	Methods	Sample	Intervention	Measures	Cost of Intervention	Complexity of Intervention	Additional Training	Study Outcomes
Unamba et al. (2006)	Assessing the impact of the flipped classroom to enhance pupil engagement	Questionnaire	85 primary school pupils	Flipped classroom	Behaviour-al, emotional, cognitive and agentic engagement	Medium	Medium	Yes	Promotes active learning and increases academic engagement
Ural et al. (2017)	Assessing the impact of a jigsaw technique on pupils' motivation, engagement and academic performance	Questionnaires	25 6th year pupils in the experimental group; 24 6th year pupils in the control group	Jigsaw method	Motivation, engagement and academic achievement	Low	Medium	Yes	Improved academic engagement and motivation
Watson et al. (2016)	Assessing impact of a colour wheel system on pupil behaviour	Observation and survey	59 kindergarten pupils in three classes	Colour wheel system	Disruptive behaviour	Medium	Medium	Yes	Big decrease in disruptive behaviour and a high level of acceptance by teachers
Yunus & Chien (2016)	Assessing the impact of a mind-mapping strategy on pupils' English writing skills	Questionnaires	25 pre-university pupils	Mind-mapping	Engagement and performance	Low	Medium	Yes	Improved engagement and performance of pupils in English writing

In a study conducted by Yunus and Chien (2016), a mind-mapping strategy was adopted, this being the graphical representation of ideas/concepts and the relationships between them. Mind-mapping can be applied in learning a range of subjects. Accordingly, Yunus and Chien's (2016) study attempted to identify the impact of a mind-mapping strategy on pupils preparing for the Malaysian University English Test (MUET) in writing. Questionnaires were distributed to collect data from 25 pre-university pupils preparing for the MUET in writing. The study findings indicated that most of the pupils had positive perceptions of using the mind-mapping technique and found it very useful for improving their writing skills. The study identified increased engagement among the pupils in learning English writing when supported by mind-mapping. However, only few pupils perceived mind mapping to be an effective approach, reporting it as difficult and time-consuming to implement.

Focusing on other active learning approaches, Marquez et al. (2017) applied a jigsaw technique, which is a teaching strategy for organising group work among pupils, whereby they collaborate and rely on each other to complete tasks. The researchers used two groups – intervention and control – to analyse the impact of the jigsaw technique in their approach to learning. The intervention group consisted of 28 pre-university pupils, who applied the technique while working on constructing concept maps about radioactivity. Meanwhile, the control group received traditional classroom-based lectures to enable them to complete their task. The results revealed that pupils in the intervention group were more successful in their learning about radioactivity. Moreover, the jigsaw method fostered a positive attitude towards the topic among the pupils in the intervention group, who thought the method was very motivating and encouraging, even though it was new to them. Despite the jigsaw technique being identified as enhancing academic engagement, given the context of the current study (first-year pupils in primary schools in Saudi Arabia), it may be considered irrelevant. However, the aspect of motivation for learning may be considered when identifying relevant approaches.

A similar study conducted by Dewitt and McLuskie (2019), investigating the impact of the jigsaw technique on knowledge retention and pupils' engagement in their first year of a BA Enterprise and Entrepreneurship course, produced some interesting results. The study was aimed at analysing knowledge retention and pupil engagement in entrepreneurship education. This involved various types of content and concepts that needed higher pupil engagement and knowledge retention than for other courses. Specifically, the impact of the jigsaw method was assessed using a survey of first year BA Enterprise and Entrepreneurship students at Coventry

University. The study elicited that the students found the course ‘intellectually stimulating and engaging’ when a jigsaw technique was adopted in their learning. The researchers concluded that active learning techniques such as the jigsaw approach, not only increased pupils’ engagement in learning, but also, helped them retain the knowledge gained (Dewitt and McLuskie, 2019).

Similarly, Ural et al.’s (2017) study was focused on jigsaw techniques with a sample of 6th year pupils at a government school in Kahramanmaraş, Turkey. The impact of these techniques on motivation and engagement in learning was investigated in a science unit, titled: ‘Force and Motion’. Two groups were utilised for this investigation: an experimental group ($n=25$), which adopted the jigsaw technique, and a control group ($n=24$), where traditional learning methods were adopted. Data were collected using questionnaires at the beginning and end of the intervention (jigsaw). At the end of the intervention, the pupils in the experimental group reported greater academic achievement, engagement, and motivation than the control group. Thus, the study outcomes demonstrated that the jigsaw technique was effective among young learners in improving their attitude and motivation towards learning.

Focusing on other active learning approaches for managing academic engagement and disruptive behaviour, Przybylski and Mishkin (2016) probed the impact of an electronic gaming intervention on pupils’ academic engagement, hyperactivity and other behavioural issues. A questionnaire was deployed as the data collection method, with 217 primary school pupils. It emerged that those who engaged in low levels of gaming (less than one hour per day) exhibited low hyperactivity and few behavioural issues. In contrast, those who participated in high levels (more than three hours per day) demonstrated greater hyperactivity and exhibited more behavioural issues. These findings indicate that electronic gaming can result in digital violent behaviour, as identified by Radulovic and Krstic (2017). However, fewer peer and emotional difficulties as well as higher levels of active academic engagement were observed among pupils who played cooperative and competitive online games. It was concluded that controlled game-based learning can result in substantial improvement in pupils’ positive behaviour, emotional stability, and academic engagement. However, whilst this approach was identified as effective, it might not be suitable for first year pupils (study sample), as they may not have sufficient technical skills to play the games.

The ‘Good Behaviour Game’ is another important tool that has proven to be successful in managing disruptive behaviour in the classroom and improving academic engagement

(Lynch & Keenan, 2018). This game involves dividing the class into groups, which then compete with each other in exhibiting good behaviour. In this regard, Lynch and Keenan's (2018) study on 20 primary school pupils in Northern Ireland produced some interesting results. For instance, there was much reduction in disruptive behaviour among the pupils when the game was first introduced. In addition, significant change in staff behaviour was identified towards the game, with many teachers adopting the approach in their own way to manage disruptive behaviour. In relation to the sample under observation, the teachers were asked to make positive comments in the classroom; however, these were minimal. Hence, given the very few positive comments from the teachers that were noted, the Good Behaviour Game might not be effective in controlling pupils' disruptive behaviour in the classroom. In addition, there is a need for teacher training in how to implement the Good Behaviour Game and the practices to be adopted by teachers during the game, which would require more resources and time. However, training could be appropriate and even necessary in cases where the teachers are unaware of active learning approaches and their use.

Similarly, Rubow et al. (2018) probed the impact of the Good Behaviour Game on pupil and teacher behaviours. The sample included fourth- and eighth-year pupils in two classes, where they were observed for their behaviour. The findings showed a high reduction in the disruptive behaviour of both classes, and an increase in positive teaching approaches (such as teachers' use of praise relative to reprimanding). That is, the teachers praised the pupils more often than reprimanding them, which appeared to increase the pupils' motivation and engagement towards learning. A survey was conducted at the end of the intervention, administered to teachers and pupils to collect their perceptions of the Good Behaviour Game. Social validity (acceptance by teachers and pupils) measures indicated that both teachers and pupils strongly approved of the game. Thus, previous studies on the Good Behaviour Game have revealed that the collaboration and engagement of peers and teachers in the learning process can improve academic engagement and reduce disruptive behaviour.

Considering other active learning approaches, Duchaine et al. (2018) focused on a different active learning technique, namely, response cards. These are reusable cards that allow pupils to respond to questions posed by teachers. These cards can either be blank (for writing answers to the questions) or printed with 'True/False' or 'Yes/No'. The teacher can monitor the pupils' engagement by asking them questions that they answer by displaying the appropriate card. Duchaine et al. (2018) used response cards as an alternative to the traditional hand-raising approach in high schools. Their study included two teachers and three pupils with

a history of challenging behaviour, along with three without such behaviours, in two classes at a suburban school in South-West USA. Observations were made during the intervention using a checklist. At the end of intervention, the pupils and teachers were asked to complete the Treatment Acceptability Rating Form-Revised (TARF-R) to elicit pupils' perceptions (effectiveness, enjoyability, ease of using response cards, and impact of response cards on participation and learning), and teachers' perceptions (treatment acceptability, perceived effectiveness, and perceived disadvantages) regarding the cards. Hence, the responses from the TARF-R were used to assess the social validity of the intervention. It emerged that using the cards led to an increase in pupil engagement, improved academic achievement, and reduced disruptive behaviour, whilst the results for social validity revealed strong acceptance of using response cards among both the teachers and pupils.

A similar study was conducted by Paulish (2018) on primary school pupils. However, printed response cards (with Yes/No; A/B on two sides) were used instead of blank ones. Three pupils were considered for observation out of a year two class in a state-sector school in Florida. The data were collected using classroom observations, which included disruptive behaviour, rate of response, and accuracy of response. Behavioural skills training (BST), an instructional method used to teach new skills (Kirkpatrick et al., 2019), was provided to the teacher. This training consisted of an instructional period, modelling performed by the primary investigator, an opportunity for the teacher to rehearse the intervention, and feedback from the primary investigator on the appropriate implementation of the intervention. A modified intervention rating profile was used to collect responses from the pupils and teachers at the end of the intervention, in order to assess its social validity. The findings revealed a substantial decrease in disruptive behaviour across all three disruptive participants, and an increase in the rate and accuracy of response, thereby reflecting good engagement and academic scores. The social validity results showed that the response cards were considered as being an effective approach to reducing disruptive behaviour by the teacher, while the pupils found the technique interesting, also reporting that it had helped them to learn more actively.

These studies (Duchaine et al., 2018; Paulish, 2018), although small scale, revealed that the response card approach is easy to implement and can achieve effective results in improving academic engagement and reducing disruptive behaviour. However, hand-raising is a similar approach, which has been traditionally used to assess pupils. Therefore, it is essential to determine the impact of both response cards and hand-raising approaches on pupils' academic engagement and disruptive behaviour. In this context, Lambert et al. (2006) compared the

impact of both approaches on pupils' disruptive behaviour in year four classes, under two conditions: firstly, when the teacher asked a question, the pupils were to respond by raising their hands, while secondly, they had to write a response on the white board presented to them. Disruptive behaviour was observed under both conditions among nine pupils with high levels of challenging behaviour, as identified by the participating teacher. An increase in academic response and engagement, together with a greater reduction in disruptive behaviour, were observed under the response card condition, compared to the hand-raising one. In particular, a marked increase in academic participation was observed among low-performing pupils. Therefore, response cards may be considered as an easy to implement and cost-effective active learning approach, which can be applied in large classes to assess pupils.

Considering the response card technique, Stowell and Nelson (2007) integrated this approach with interactive technology to investigate the impact of electronic pupil response systems on pupils' engagement and attitudes to learning. These response systems are similar to response cards, but the responses are facilitated through electronic devices used by the pupils. They have some advantages, such as being easy to use and offering anonymity for pupils' responses, thereby increasing participation (Nelson, 2007), which is due to less reluctance to answer questions in front of peers. However, response cards do have a few disadvantages, such as pupils cannot always correct their answers, if they make mistakes while entering their responses, and it can be expensive for schools to deploy such technologies (Aggarwal, 2018).

Stowell and Nelson (2007) compared four different approaches to increasing academic engagement, including the pupil response system, response cards, hand-raising, and standard lecture methods of teaching, with 35 college pupils in each category. The results indicated that participation was highest in the electronic response system group (followed by the response card group). In addition, a social validity questionnaire revealed that the pupils favoured engaging in pupil response systems (SRS) the most. A follow up study (Aggarwal, 2018) with older, university-age pupils showed that the electronic system was effective among graduate and undergraduate ones. However, whilst these systems are easy to use with older students and pupils, they may be too complex for primary school pupils.

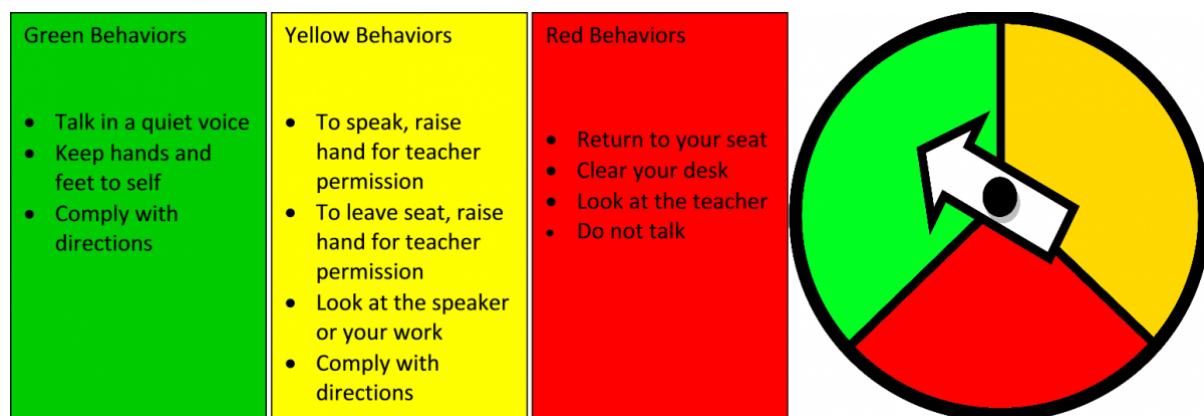
Ruiz-Olivares et al. (2010) investigated the impact of an integrated approach, which involved adopting both the Good Behaviour Game (Harris & Sherman, 1973) and 'say-do' reporting (Luciano-Soriano et al., 2000). Say-do reporting is a process whereby pupils are

asked about what they would do in a particular context (for example, how they would change themselves to engage in positive classroom behaviour). They were asked to complete a report on what they did to adopt positive behaviour, explaining their approach, progress, and providing the results. Fifteen primary school pupils were included in the intervention, and the findings revealed that the integrated approach was effective in reducing disruptive behaviour.

Watson et al. (2016) investigated a similar approach to response cards, called the ‘Colour Wheel System’, with the aim of reducing pupils’ disruptive behaviour. This system consists of colour boards, outlining the rules that must be followed by pupils in the classroom. The rules are written on these boards, accompanied by a wheel with a pointer indicating the type of behaviour desired, as shown in Figure 2.4.

Figure 2.4:

Colour Wheel System (Fudge et al., 2008; Kirk et al., 2010)



The rules can be placed on the wheel or written on the respective colour boards and positioned in the classroom, where they can be easily observed by the pupils. The teachers can rotate the pointer to rest on different colours, according to the required behaviour. In the above illustration, the three colour boards are red, yellow, and green. Here, red rules may include keeping one’s eyes on the teacher, remaining in one’s seat or on the carpet, not talking, and being ready at one’s desk. Meanwhile, yellow rules could include raising one’s hand, waiting to speak, keeping one’s hands and feet to oneself, keeping one’s eyes on the teacher, and following directions. Finally, green rules may include keeping one’s hands and feet to oneself, using indoor/table voices, and following directions. Accordingly, if the teacher is ready to teach and requires the attention of all the pupils, the pointer may be placed on red, whereas if the teacher wants a group discussion, the pointer can be placed on yellow. The pupils should follow the rules on the board that correspond to the position of the pointer, as determined by the

teacher. This approach can gather pupils' attention towards the teacher by engaging them in fun, activity-based learning.

However, there is a need for special training for both teachers and pupils in implementing the Colour Wheel System. That is, pupils need to have the rules explained for each card, and teachers need to be trained in how to use the system. Nevertheless, both parties should become familiar with the approach after a few sessions of using it. Thus, the risk of making mistakes is high in the initial sessions and pupils may be excused for violating the rules until they get to know them. Overall, this approach is aimed at engaging pupils in learning by involving them in an activity that is fun and interesting. For Watson et al.'s (2016) study, the impact of the Colour Wheel System was investigated, and the findings revealed reductions in disruptive behaviour, which were immediate and observed across a large proportion of the pupils. In addition, the approach was accepted as being beneficial by all the participating teachers.

Aspiranti et al. (2018) studied a concept that was similar to that of the Colour Wheel System, probing its impact on reducing the disruptive behaviour of year two primary school pupils. An immediate decrease in inappropriate vocalisations from pupils was observed. Moreover, a survey at the end of the intervention, conducted among pupils and teachers, revealed that the majority of the sample considered the Colour Wheel System to be fun, which they enjoyed and hence, wanted to use again in future. This may suggest that pupils are drawn to an approach that is visually attractive.

active learning techniques such as those relating to cooperative and collaborative learning, have been identified as producing satisfactory results in managing behavioural and engagement issues in Saudi Arabia (Algarfi, 2010; Alqahtani, 2017). Although collaborative learning practices are still in their infancy in the Arab world, Algarfi (2010) used collaborative learning as an intervention, identifying that pupils' enjoyment was enhanced. This enjoyment was characterised by the pupils' new-found freedom and the opportunity to take greater ownership of and responsibility for their own and their peers' learning, while teachers described and demonstrated a number of aspects of their practice, involving a shift towards a more pupil-centred classroom, with their role becoming more that of a learning facilitator. Over the past few years, an increasing emphasis on collaborative learning practices has been observed in Saudi Arabia (Alqahtani, 2017), with these having been increasingly adopted.

This review of various active learning techniques has revealed varying degrees of impact on pupils' academic engagement and disruptive behaviour. As most of these approaches

require collaboration between teachers and pupils, there is a need to understand the types and levels of interactions in detail. For instance, active learning approaches, such as colour response cards, require interaction between pupils and teachers. This can take various forms, as explained in the following subsections.

2.6.2. Classroom participation

Active engagement requires the real-time participation of pupils in learning, such that they are not seen as passive recipients (Nissim et al., 2016). Hand-raising is one of the most common forms of signalling a request to participate, by means of which a pupil can either express doubt or request further information from the teacher (Aggarwal, 2018). This approach is easy to implement, with pupils from a young age finding it fun and engaging, in contrast to those studying in secondary schools or college-level education (Aggarwal, 2018). In addition, hand raising is a low-cost strategy, which can be implemented effectively in schools on a tight budget to ensure higher levels of academic engagement (Duchaine et al., 2018; Paulish, 2018).

In order to improve pupils' academic engagement, teachers need intervention strategies that are not only effective, but also, easy to implement, low cost, enjoyable for them and their pupils as well as being adaptable to different types of subject content (Wood et al., 2009). In addition, these interventions should be fun and engaging to attract pupils and hold their attention (Bittinger, 2015; Duchaine et al., 2018; Pellowe et al., 2015). Traditionally, teachers have used hand-raising to elicit overt responses and thereby engender academic engagement in their pupils, but there are multiple reasons why they might not raise their hands, such as simply not knowing the answers, shyness, lack of interest, or having a problem with the teacher (Aggarwal, 2018; Dixon et al., 2009). Dixon et al. (2009) highlighted the problems associated with hand-raising, with videotapes showing that when raising a hand to speak, pupils would often disengage once the teacher had selected a pupil to answer.

Active learning approaches can incorporate effective teaching strategies to help reduce pupils' disruptive behaviour and increase their academic engagement. Some types of teaching strategy offer more chances for pupils to actively respond to the teacher's instructions, having been found to increase pupils' response rates. Six of those successful strategies, according to States et al. (2019), include the following.

- 1) Active pupil response (Bittinger, 2019; Duchaine et al., 2011; Fisher & Berliner, 1985; Greenwood et al., 1984; Lambert et al., 2006; Pellowe et al., 2015; Stanley & Greenwood, 1983).
- 2) Choral response, which is an instructional strategy that encourages pupils to respond verbally and simultaneously to the teacher's questions, in unison (Godfrey et al., 2003; Heward, 1994, 1997; Johnson et al., 1996; Sainato et al., 1987; Wolery & Ault, 1992). This strategy has various advantages and disadvantages, for example, it can be effective in allowing pupils to participate actively in the learning process and receive immediate feedback. It also facilitates the teacher's rapid assessment of the pupils' learning (Haydon et al., 2017; Messenger et al., 2017). However, one of its disadvantages is that not all pupils will always actively engage, and it is not possible for teachers to assess individual ones when using this approach (Haydon et al., 2013; Sterling et al., 1997).
- 3) Unison response refers to choral response to a teacher, according to his or her signal (clapping hands, finger snapping, etc.) (Heward, 1997; Pratton & Hales, 1986).
- 4) Direct instruction pertains to the use of straightforward, explicit teaching techniques, usually to teach a specific skill (Skinner et al., 2005).
- 5) Guided notes refer to teacher-prepared handouts that outline lectures, audio-visual presentations, or readings, where blank spaces are provided for pupils to fill in key concepts, facts, and definitions, where appropriate (Larwin et al., 2012; Lazarus, 1996).
- 6) Response cards (as described above) (Cavanaugh et al., 1996; Wood et al., 2009).

Interaction, by its very nature, will either involve no response or something being said, so there is always an outcome. In the context of teaching mathematics to young pupils in a whole-group situation, teachers aim to elicit whether they have grasped what is being taught, whilst pupils will also want to know whether or not they have understood correctly. Hence, there is a need to consider the feedback loop between the pupil and teacher and vice versa. For a whole-group teaching situation, there is evidence that positive interaction, involving effective feedback, supports motivation and satisfaction in learning. When considering these strategies, a closer look at teacher and pupil feedback is essential to motivation for classroom participation, which is the subject of the following subsection.

2.6.3. Teacher-pupil feedback

Hattie and Timperley (2007) claim that one of the most powerful influences on learning and achievement is feedback, as it provides pupils with the opportunity to find out what the teacher thinks of their work. This is supported by Kluger and DeNisi (1996), who found that both positive and negative feedback can be advantageous to learning. Van-Dijk and Kluger's (2001, p.1091) study reinforced the evidence that “positive feedback increases motivation relative to negative feedback for a task that individuals ‘want to do’ and decreases motivation relative to negative feedback for a task that individuals ‘have to do’”. Four main levels of feedback were identified by Kluger and DeNisi (1996), including: task, process, self-regulation, and self-level.

First, feedback can be task-based, for example, when assessing whether the work is correct or incorrect. Second, it can be aimed at the process used to create or complete a task, for example, “This page may make more sense if you use the strategies we talked about earlier” (Hattie & Timperley, 2007, p.90). Third, feedback to pupils can be focused on the self-regulation level, including self-evaluation or the confidence to engage in a task. Lastly, feedback can be directed to the ‘self’, i.e., being unrelated to task performance. Feedback is effective when the information can be used to enhance the learning process. Process and self regulation feedbacks are therefore considered to be efficient for their profound effect on processing and improving task proficiency.

Timely and appropriate feedback can help pupils to actively engage in learning, given that their concerns or doubts can be addressed in the classroom during the lesson, thus enabling them to focus on the lessons being taught (Van Uden et al., 2014). However, the right kind of feedback needs to be directed at the right level to the right pupil, in order to have a positive effect on that pupil. An important feature of feedback is that it should indicate the logical connections regarding the task, and be clear and meaningful for pupils (Kaplan & Assor, 2012). Teachers are required to give the right feedback, when necessary, for this will encourage pupils’ positive behavioural engagement. In this regard, studies have found that praise from the teacher in the classroom, as a type of performance feedback, can reduce pupils’ disruptive behaviour (Reinke et al., 2007, Reinke et al., 2008).

2.6.4. Formative assessment

In terms of implementing active learning strategies, assessment of learning (pupils), assessment for learning (improving pupil learning through feedback), assessment outcomes, impact of assessment outcomes on teachers' perceptions and teaching practices as well as assessment in general, are considered in this study. This is in order to evaluate the impact of an active learning approach on pupils' active engagement and disruptive behaviour. It is important to assess the change in pupils' behaviour whilst using such an approach. Accordingly, assessments are implemented to ascertain whether pupils have understood concepts; to support learning among pupils by providing feedback, and to support teachers in modifying their teaching styles and improving their decision-making about their teaching.

Formative assessment can be carried out in several different ways, which Black and William (1998) have reviewed, while further reviews have confirmed the potential of assessments to improve pupil achievement. However, the focus of formative assessment mainly relates to academic achievement, rather than disruptive behaviour. One experimental study, called 'Inside the Blackbox', suggested a considerable impact of assessment for learning across all age groups (from pre-school to undergraduate level), finding that formative assessment was particularly beneficial for low achievers (Black & William, 1998). These authors held that for such assessment to be successful, pupils need to be taught how to set goal-oriented criteria, assess their own progress, recognise areas that need improvement, and understand the necessary strategies to achieve this. Formative assessment is considered as an effective technique, because interactive feedback is a critical feature in determining the quality of a learning activity and thus, it should be a central feature of pedagogy (Black & William, 2008). In addition, Black and William (2008) contended that with respect to autonomy, i.e., making pupils owners of their own learning (Hidi & Harackiewicz, 2000) to increase their learning engagement and progress, aspects that include attribution (Dweck, 2000), metacognition (Hacker et al., 1998), and motivation (Ryan & Deci, 2000) need to be considered. These factors will shape pupils' attitudes to learning, with support from teachers and in an effective classroom environment. By practising relevant and appropriate intervention strategies, as reflected in the conceptual framework for this current study (see Figure 2.3), pupils' academic engagement and disruptive behaviour can be managed effectively.

Formative assessment is an important type for learning, this being an approach to teaching and learning where feedback is provided to pupils immediately, in order to improve

their performance. William and Thompson (2007) define assessment for learning as a tool for assessing the teaching/learning experience. On the one hand, it helps the teacher identify the pupils' actual level of achievement, while on the other, the teacher's instructions are put into practice by helping pupils to improve their subject knowledge and enhancing their motivation to continue learning. Assessment for learning involves two kinds of assessment, formative and summative. The former is considered in this current research.

Formative assessment is concerned with understanding the pupils' progress during the learning process (Black & Wiliam, 1998). In this context, aside from understanding and evaluating pupils' knowledge, if they are given the chance to build upon prior knowledge and experiences, they learn more effectively. This can be achieved through metacognition (Flavell, 1985; Hacker et al., 1998), whereby they reflect on their own learning processes, with regard to the new knowledge, skills, and understanding that they have acquired. Flavell (1985) states that metacognition cannot always be accurate, because it will depend on the individual's level of awareness, which substantially varies. Hacker et al. (1998) argue that metacognition promotes self-regulation, judgement, and accuracy in decision-making. Therefore, interventions such as active learning techniques should incorporate assessment methods that will improve pupils' academic engagement.

Based on a review of various active learning approaches and their applicability, the use of colour response cards is considered to be an effective technique for gathering pupils' attention and engaging them in learning. In addition, it has various advantages: it is cost-effective, collects immediate responses from pupils, helps teachers provide instant feedback, supports learning in a collaborative environment, and most importantly, is easily trainable and simple to use (Munro et al., 2009). Nevertheless, before discussing the use of colour response cards for managing academic engagement and disruptive behaviour, it is essential to understand the assessment process, which involves investigating whether pupils are engaged in learning, as explained in the next section. Given the issues associated with academic engagement and disruptive behaviour, clarified in the previous sections, the need to use active and collaborative approaches to improve academic engagement and minimise disruptive behaviour in learning is examined in this current study. The following section illuminates and justifies the use of colour response cards over other techniques. Nevertheless, before discussing the use of colour response cards for managing academic engagement and disruptive behaviour, it is essential to spot the appropriate techniques that best fit into the Saudi context as explained in the next section.

2.6.5. Selection of appropriate techniques in the context of Saudi Arabia

The review of major studies focusing on active learning approaches in the previous section revealed that almost all are effective in reducing pupils' disruptive behaviour and increasing their academic engagement. Whilst these studies have been distributed across various sample populations, including primary school and secondary school students as well as university students, very few have considered younger learners from primary schools. Approaches that have focused on a sample that does not consist of primary school pupils revealed, for example, pupil centred factors (motivation, engagement, interest, etc.) to be worthy of consideration when selecting the appropriate techniques for managing academic engagement and disruptive behaviour. In consideration of the type of intervention performed, how it was implemented, its complexity, cost, and additional training, it is suggested that approaches, such as response cards can be more effective than other active learning approaches. Instant feedback would appear to be very effective for disruptive pupils, as it enhances self-control (internalisation of control) and active engagement in learning (McNamara & Jolly, 1990a). Accordingly, McNamara and Jolly (1990b) found that increased levels of engagement in on-task behaviours can result in reduced disruptive behaviour among primary school pupils. Hence, active learning strategies, such as response cards, which can be used to provide instant feedback and increase academic engagement, easy to implement, and can be effective in reducing pupils' disruptive behaviour.

Despite the flipped classroom approach having been found to increase academic engagement among primary school pupils, it might not be appropriate in the Saudi context, where it could be nigh on impossible to undertake, given the socio-cultural and religious factors (mixed-gender classrooms prohibited; outdoor learning not traditionally practised) as well as the large class sizes. However, the idea of an instant feedback system could be integrated into the Saudi classroom. Reviewing the studies that have been dedicated to the jigsaw technique, it was noted that pupils' engagement and motivation towards learning are two important factors to take into account. However, the jigsaw technique was not considered feasible in the Saudi context, given the study sample (first-year pupils) involved. Previous studies (Aggarwal, 2018; Stowell and Nelson, 2007) have focused on integrating active learning approaches with technology. However, these require the training of both pupils and teachers as well as involving high complexity and costs. As a result, these techniques might not be appropriate in the Saudi context, due to the Kingdom's dependency on expatriate teachers from all over the world, who have not always been trained in using these systems.

Low-cost interventions are necessary, as the focus is not on completely changing the school system in Saudi Arabia, but rather, applying feasible interventions that cost little, are easy to implement as well as being effective for managing academic engagement and disruptive behaviour without affecting the existing system. Whilst there are cost-effective interventions, such as the jigsaw technique identified in this literature review, they might not be applicable to all year one primary school pupils, as they require group work and collaboration, which are more common in higher levels of education (Nusrath et al., 2019). There are other approaches, like gamification or technology-based interventions, such as multimedia learning and the digital classroom. For instance, the mind-mapping strategy may be effective and feasible in the Saudi context. However, given the sample population in this study (year one pupils), and the choice of subject (mathematics), this approach might not be feasible. In the context of Saudi Arabia, these are approaches that require huge investment and are not easy to implement (considering the typically conservative views against using technology) (Lily & Alhazmi, 2020). For this reason, they are mainly applicable to pupils above the age of 10 years, in order to fully reap the benefits. In addition, these approaches mostly focus on teaching and learning, thereby leaving less scope for assessing whether pupils have understood the concepts. In the focal context, there is a need for an academic engagement approach that is easy to implement, effective in providing feedback, and facilitates assessment.

In this regard, colour response cards can be an appropriate and cost-effective approach that is easy to implement, given that it requires minimal training to do so. Mathematics is a complex school subject, with its study necessitating analytical techniques and computational skills, making it difficult for primary school pupils to learn (Leavy et al., 2010). The use of interventions that are fun, engaging, and actively engage pupils can enhance the process of learning mathematics at primary school level. Response cards can actively engage pupils in learning challenging subjects, such as mathematics (Christie & Schuster, 2003). The hand-raising and response cards (writing answers to a teacher's question on the back of a response card) are tools that have been found to impact on year four pupils' classroom engagement, and these were compared by Christie and Schuster (2003) during a mathematics lesson. The results indicated that pupil participation, specifically, the number of pupil-initiated opportunities to respond and the number of actual pupil responses, were higher with response cards than with pupils simply raising a hand. Teaching primary school pupils requires effective strategies to engage them and review their levels of understanding before continuing to the next stage of learning. That is, the teaching approach should focus on pupils' engagement in learning and

their assessment of their learning. Such studies have shown increased pupil engagement results in reduced disruptive behaviour in the classroom (Kellum et al., 2001; Randolph, 2007). In addition, as previously mentioned, response cards have been found to be especially easy to use with primary school pupils, because they do not require any additional training.

Some studies (Christie & Schuster, 2003; Yunus & Chien, 2016) have identified that active learning approaches can be effective in supporting the learnability of perceived complex subjects, such as mathematics. However, the literature on mathematics learning, academic engagement, and disruptive behaviour has paid little attention to the quality of the pedagogical methods used (Tan, 2016). A recent systematic review by Tan (2016) on this topic found that the mathematics assessments conducted ranged from very basic to comprehensive, with most studies (Chen & Su, 2018; Dewitt & McLuskie, 2019; Stowell & Nelson, 2007; Unamba et al. 2006) involving the application of basic assessment strategies. Thus, most of the research, to date, has been focused on intervention strategies that target procedural and rote knowledge, with the majority having utilised quantitative inquiry methods of data collection (Aggarwal, 2018; Duchaine et al., 2018; Rubow et al., 2018; Stowell & Nelson, 2007; Watson et al., 2016). Meanwhile, in recent years, studies have increasingly examined conceptual mathematical understanding and used qualitative inquiry methods to this end. A more recent study (Abeygunawardena & Vithanapathirana, 2019) elicited that some learners were reluctant to learn mathematics. Hence, the application of innovative teaching methods is imperative for motivating learners to actively participate in the process of teaching and learning mathematics (Abeygunawardena & Vithanapathirana, 2019). In addition, techniques that serve as a more or less collaborative approach may reflect an informal and more interactive approach to engaging pupils in learning.

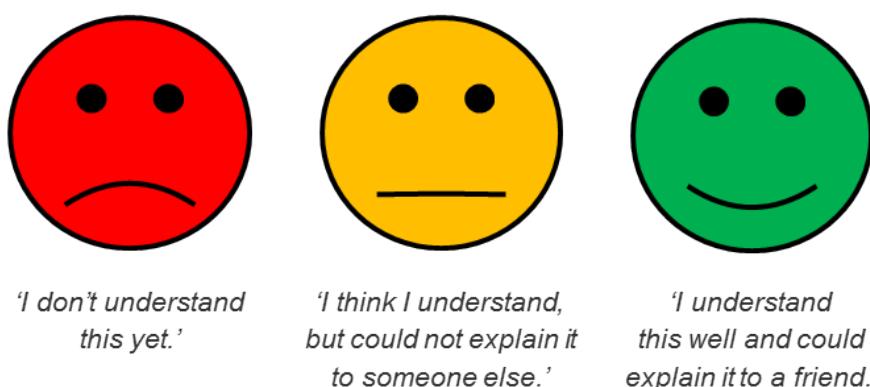
This review of active learning techniques and their impact on academic engagement and disruptive behaviour reveals that very few studies have analysed the impact of cost-effective and easy-to-implement techniques such as colour response cards, which is considered as being a major gap in the literature. In addition, analysing the effectiveness of colour response cards when studying complex subjects, such as mathematics, would fill the research gap pertaining to the use of cost-effective techniques for teaching this subject. In addition, given the context of Saudi Arabia and the typically large class sizes in the Kingdom, the intervention needs to be easy to implement, easy to use, cost-effective, fun, and engaging. Considering these factors, a colour response card intervention was identified as most appropriate in this case.

2.7. Colour Response Cards and Pupil Behaviour

As previously explained, response cards are reusable signs or cards that pupils can utilise in the classroom to respond to their teacher's questions (Gardner et al., 1994). They have been found to have a positive impact on pupils' behaviour (Armendariz & Umbriet, 1999), as well as on teachers' instructional decision-making (Hamlin et al, 2008). Research on response cards began as early as 1969 (Meagher, 1969) and their use was still considered effective by some researchers (Maheady et al., 2002; Randolph, 2005a). As response cards give immediate feedback to the teacher, it is important to look at the research on feedback and its role in engaging pupils in learning. In this regard, two specific websites provide interesting information, offering practical advice on how to introduce assessment for learning into teaching, and including strategies that closely resemble the present study's use of colour response cards. The first of these websites, the Cambridge Assessment International Education (CAIE) (<https://www.cambridgeinternational.org/>) points out that one form of feedback from pupils to their teacher involves three kinds of 'traffic light', which each pupil can display as per the feedback being communicated (see Figure 2.5). The source explains that this technique is a quick way of ascertaining how confident learners feel about a new concept or skill that has been covered in a lesson. Some schools in the UK make use of these traffic light icons (green, yellow or red), as an effective means of pupils conveying their level of understanding: good, partial or poor.

Figure 2.5:

Example of traffic light icons (JIS-COER, 2015)



The second website of interest is the Open Resource Bank for Interactive Teaching (ORBIT), representing a JISC OER 3 project at Cambridge University's Faculty of Education (JISC OER, 2015). It recommends the use of robots/traffic lights in the classroom. During the lesson,

teachers can ask pupils to hold up a coloured card to indicate whether or not they should proceed to the next topic. It is at the discretion of each pupil whether to hold up a card showing their current level of understanding. Consequently, pupils can independently and autonomously make decisions over displaying the red/green cards, based on their self-assessment. This approach can engage pupils in the learning process and enhance their motivation to learn, with the external factor (initiative by teachers) influencing their intrinsic regulation (interest in learning, satisfaction, competence). Pupils may hold up a different coloured card several times during a single lesson. In doing so, they will communicate their understanding to the teacher, without disturbing other classmates or the course of the lesson. When the appropriate time comes, the teachers can address the pupils. If they are working in groups, they will display their coloured card on the table to indicate their current understanding, and if necessary, the teacher can come and assist them.

The strategy described above, involving traffic light icons in CAIE and ORBIT or colour response cards, is not only used to encourage pupils' self-assessment, but also, to help teachers adjust their instructions according to the pupils' learning needs. For instance, pupils can be asked to use their 'traffic light' icons in a given task to assess it by allocating the task a red or green icon. The teacher can then assign the 'greens' to work in pairs, while spending more time with the 'reds' to ensure that they understand; addressing their learning difficulties as required.

Thus, colour response cards can be used to provide ongoing feedback to the teacher. The strategy, as discussed, involves both pupils and teachers in the teaching and learning process in the classroom. Accordingly, it could be argued that the role of both parties must be effectively analysed from various perspectives to assess the impact of colour response cards on academic engagement and disruptive behaviour. For example, colour response cards can be an effective means of helping teachers make the right decisions. However, no research has focused on their actual effect on teachers' decision making. Even Hamlin et al.'s (2008) research on the effects of coloured or white response cards focused primarily on pupils' outcomes and behaviour, rather than teachers' decision-making. The following subsections discuss the impact of colour response cards on pupils' learning and classroom engagement, as well as teachers' decision-making and assessment procedures.

2.7.1. Impact of colour response cards on pupils

Studies have been conducted in primary school classes to determine the impact of using response cards on improving pupils' behaviour in various lessons, including mathematics (Armendariz & Umbriet, 1999), science (Gardner et al., 1994), social studies (Narayan et al., 1990), and vocabulary (Munro & Stephenson, 2009). Armendariz and Umbriet (1999), for instance, evaluated the effects of using response cards on the disruptive behaviour of 22 pupils in a year three general education classroom during their mathematics lessons. Two methods were adopted: firstly, conventional hand-raising by pupils, where a teacher asked a question and then, selected one pupil out of those who had raised a hand to answer it, and secondly, all pupils were required to write answers on the back of a response card provided. The authors found that disruptive behaviour decreased dramatically when response cards were used, compared to the conventional hand-raising method. However, there are few limitations identified in the study with regards to the sample and data collection, which include small sample; the data were only collected in a single session; and the level of disruptive behaviour identified was not severe.

In addition, the use of response cards has proved to be more effective in containing disruptive behaviour, boosting academic engagement, and increasing the number of accurate responses more effectively than the classic hand-raising strategy. In an important study for this research, Cassell (2016) investigated the influence of response cards on academic engagement, disruptive behaviour, and pupils' correct responses, as well as the best types of question to use with response cards, regarding pupils' behaviour and outcomes. According to the researcher, pupils' disruptive behaviour consisted of:

...talking to peers (e.g., whispering, engaging in off-topic conversations) when teacher was talking or giving instructions, calling out (e.g., calling the teacher's name, yelling out answers to questions), getting out of their seat, or any other behaviour requiring teacher redirection (e.g., dancing, gesturing to other pupils) during the instructional time.
(p.15)

Academic engagement was calculated by dividing the number of questions answered using hand-raising or response cards, by the number of opportunities to answer throughout the instructional time. The data relating to disruptive behaviour pertained to the use of a 15-second, partial-interval recording procedure by a dedicated teacher for each group. The study

was conducted at an urban school with a sample of year four and five pupils in the US, with two pupils in each class having a history of disruptive behaviour and difficulty, with academic engagement observed. After the response card intervention, reduced disruptive behaviour was observed among all the pupils. However, no major change in disruptive behaviour of all the pupils was observed during the hand-raising strategy intervention. Thus, the study revealed that response cards can enhance academic engagement and reduce disruptive behaviour. However, there are few limitations identified in the study such as collection of small number of data points. Similarly, Khan (2015) conducted a study which included five male pupils aged between eight to ten years who are highly disruptive. The findings revealed that the response cards were not only effective in reducing disruptive behaviour but also in improving the accurate responses from the pupils' when the questions are asked by teachers.

The use of response cards enhanced academic engagement and increased accurate response across all the pupils in both classrooms. Unfortunately, the study had a number of limitations, including the small number of data points collected. However, similar results were achieved in Khan's (2015) study of five particularly disruptive male pupils, aged 8-10 years, evaluating the impact of using response cards on disruptive behaviour, as well as accuracy and the percentage of questions answered. The results of the study revealed that the pupils' disruptive behaviour decreased, while the percentage of accurate responses increased. Nevertheless, there were some uncertainties and limitations of the study with regard to the variability of the aid that the participants received.

Furthermore, response cards were identified to be effective in improving pupils' participation and active behaviour in the classroom. For example, Christle and Schuster (2003) in a study on response cards identified that the pupils' participation, i.e., their responses were higher while using response cards compared to hand-raising method during mathematics instruction. Furthermore, when response cards were in use, pupils engaged in on-task activities more often, and their results were higher on the weekly mathematics quiz than when the hand-raising strategy was used. The results of the above study indicate that year four pupils' active participation, academic achievement, and on-task behaviour during whole-class mathematics instruction was enhanced by using response cards. However, the authors admitted some shortcomings in their study and questioned its credibility, as the results for the on-task behaviour were limited to the weekly mathematics quiz and not applied

to daily tasks. Hence, further research is needed to examine the efficacy of response cards in daily classroom activities.

The positive effects of colour response cards on pupils may be considered from the perspective of increased attention, improved performance, greater self-confidence, increased motivation, improved behaviour, stronger engagement, fun, and enjoyment. Response cards can increase pupils' participation and engagement in learning. Various studies (Christie et al., 2003; Duchaine et al., 2018; Kellum et al., 2001; Lambert et al., 2006; Paulish, 2018; Randolph, 2007) have found colour response cards as being effective in reducing disruptive behaviour and increasing academic engagement. Most of these studies have either used blank (for written responses) or pre-printed response cards, whereas a few (Clarke, 2010; Dogan & Tekin-Iftar, 2002) have utilised picture response ones. To the best of the researcher's knowledge, no previous study has investigated the impact of colour response cards on pupils' academic engagement and disruptive behaviour in Saudi Arabia.

Marmolejo et al. (2014) analysed the use of response cards among pupils in a quiz setting, where they were required to use them to answer questions, rather than raising their hands (the traditional method). The results revealed that using response cards improved pupils' engagement, attention, behaviour, and participation. Similarly, in a study conducted by Heward et al. (1996), analysing the use of response cards during teaching, it was found that this greatly contributed to active response rates and improved academic engagement in the classroom. In addition, Duchaine et al. (2011) concluded that response cards could be very useful in decreasing pupils' challenging behaviour (emotional and behavioural disorders, pupils diagnosed with attention deficit hyperactivity disorder [ADHD], learning disabilities, chronic challenging behaviour) and disruptive behaviour. Likewise, response cards in teaching have been found to increase motivation and engagement among pupils in various studies, considering them as being fun in the learning process (Bittinger, 2015; Duchaine et al., 2018; Pellowe et al., 2015; Twyman, 2018). Moreover, the social validity results of various studies (Kellum et al., 2001; Lambert et al., 2006; Paulish, 2018; Randolph, 2007) have revealed that response cards received high acceptance from pupils. Moreover, whilst the use of colour response cards can impact positively on pupils' behaviour, they can also help teachers improve their pedagogic process and decision-making, which is discussed in the next subsection.

2.7.2. Impact of colour response cards on teachers

The use of colour response cards has been found to have a range of advantages for teachers, including the potential to receive instant feedback, as well as facilitating classroom management, the modification of teaching strategies, assessment of pupils' needs, and adjustments to instructions. Colour response cards can help teachers assess and engage pupils in learning, which means that they are likely to be more effective in teaching subjects that require scaffolded learning, such as mathematics (Hirsch et al., 2018). For example, when explaining mathematical concepts, teachers can assess their pupils during the lesson. If they find that more pupils present green cards, then he or she can conclude that the pupils are generally following the lesson and understanding the concepts. However, if more red cards are presented, it needs to be acknowledged that most of the pupils have failed to understand the lesson, whereupon the teacher should provide more detailed explanation. This approach would not only simplify the process, but also, increase teaching time and the engagement of pupils. In the absence of colour response cards, if just one pupil expresses doubt at the end of the lesson, the teacher may need to explain a concept right from the beginning again to the whole class, which will bore those who have already understood it and increase the required teaching time to convey the subject matter. The social validity results from various studies (Kellum et al., 2001; Lambert et al., 2006; Paulish, 2018; Randolph, 2007) reveal that response cards receive high acceptance amongst teachers.

Dawn (2008) and Munro et al. (2009) found that colour-coded response cards could greatly improve the accuracy of teachers' instructional decisions. For example, if there are more red colour cards (pupils answering 'No' to a teacher's question) in an assessment, then the teacher could decide to explain the same concept in different ways (instructional decisions) until all the pupils understand it. From the perspective of Self-determination Theory SDT (Deci & Ryan, 1985),, it could be argued that the teacher's intrinsic motivation is fundamental to the teaching/ learning process and can act as an external factor to facilitate pupil autonomy. By modifying their teaching style according to their basic needs, using non-controlled conversational techniques (Pelletier et al., 2002; Reeve et al., 1999), teachers can behave in ways that help their pupils develop inner motivation and engagement, which are widely considered as the best predictors of learning (Evans & Boucher, 2015; Johnson, 2017). However, when teachers are influenced by external factors, such as responsibility and accountability, they are likely to be less supportive of autonomy and adopt controlled teaching procedures (Reeve, 2009). In this sense, the use of CRCs is helpful to reflect the extent of

motivation, autonomy and learning on the part of the learners and, more importantly, to allow the teacher to assess the effectiveness of their own teaching techniques.

2.7.3. Assessment using colour-response cards

Black and William (2008) highlighted how positive feedback can enhance motivation, while negative feedback is complex in that it can trigger self-regulation among pupils and teachers. For example, if a teacher frequently experiences negative feedback (more red cards than green, thereby indicating negative feedback on the clarity of the concept being taught), this can trigger self-regulation for the teacher, encouraging him or her to modify their teaching style in a way that is suitable for the pupils concerned. Conversely, if it is positive feedback (green cards more frequent than red), the teacher will be motivated to adopt the same teaching strategy and use CRCs as this brings satisfaction.

The link between formative assessment and colour response cards is that the cards allow for ongoing and simple self-assessment on the part of the pupils during the lesson, while at the same time providing ongoing feedback to the teacher. This is especially valuable, if use of the cards shows that the pupils do not understand something, whereby the teacher can review the situation and devise ways of resolving it. These factors are an important part of formative assessment. The relationship between self-regulation and self-assessment is crucial to note at this point. It has been deduced that pupils with a high degree of ability to self-regulate their learning assess their work more effectively and efficiently, compared to those with less ability of this nature (Lan, 1998). Various theories have identified self-assessment as an important process in learning and assessment. Puustinen and Pilkkinen (2001) reviewed five theories of self-regulation, determining that self-assessment is an important aspect of learning. Similar findings were obtained by Zimmerman (2001), who analysed seven theories of self-regulation and self-assessment. Various other studies (Belfiore & Hornyak, 1998; McCombs, 2001; Paris & Paris, 2001) have found evidence of self-assessment being a solution that infuses academic learning assessment with passion and autonomy; it involves drawing upon the three domains of self-regulated learning (cognitive, motivational, affective). Hence, there appears to be a link between self-regulation and self-assessment, which is clearly associated with learning engagement. Therefore, it is important to discuss the theories behind motivation and engagement, which are covered in the following section.

2.8. Theoretical Background: The Underpinning Theories

The current study is centred on theoretical concepts of behavioural engagement, which have already been applied in the field of education, while investigating the motivation of pupils to use colour response cards. CRCs have been utilized to improve the relationship between teacher and learner because when teachers respond to pupils' answers, pupils feel they are more cared for (Wang, 2016). CRCs also have been shown to help pupils get feedback, which increases their competence, and develops their autonomy (Kuntzmann, 2021). As discussed in the following section, these three factors, relatedness, competence and autonomy, map very closely to SDT theory. Two theoretical propositions were considered for this study, Self-determination Theory (Ryan & Deci, 2000) and Self-regulation Theory (Bandura, 1991), which are explained in the following sections.

2.8.1. Self-determination Theory (SDT)

Self-determination Theory is a macro-theory of human motivation and personality, which concerns people's inherent growth tendencies and innate psychological needs (Ryan & Deci, 2000). One of the key assumptions of this theory in the context of the current study is that behaviour is driven by needs. For instance, it is evident that if pupils find that their needs and interests lie in unproductive activities, such as making a noise, losing attention, daydreaming in class, or engaging in physical abuse, they will tend to adopt this behaviour. As a result, the disruptive behaviour in the classroom will increase, which will most probably affect teaching practices and the pupils' ability to learn. Another key assumption of SDT is that motivation is important. In order to become self-determined or undertake positive action, it is essential for people to become motivated. Young pupils lack awareness and so they need to be motivated to engage in learning (academic engagement). For example, they need to be motivated by active learning approaches, which not only hold their attention, but also, engage them in learning. In addition, teachers' timely and high quality feedback will raise their interest in learning. As a result of this process, pupils will slowly become intrinsically motivated to learn, thereby reducing their disengagement and unproductive/disruptive behaviour (Narhi et al., 2017).

Self-determination Theory (Deci & Ryan, 1985) is an important concept that should be grasped by teachers, so that they understand their pupils' requirements and motivation in the classroom setting. The theory is aimed at interpreting human motivation, self-development, and well-being (Deci & Ryan, 1985). It views humans as having a natural and inherent

tendency towards psychological health and growth, whereby they become involved in both the inner and outer world of experience. It is concerned with the psychological needs and motives associated with these processes, and distinguishes the various kinds of motivation that affect behaviour in different ways at different times (Skinner & Belmont, 1993). SDT is concerned with cultural and social incentives, which can either simplify or challenge an individual's ability to express his or her aspirations and quality of preferences, and to make appropriate decisions (Ryan & Brown, 2005). Seifert and Sutton (2009) applied the key ideas of SDT in the classroom setting, whereupon it was ascertained that if pupils realise their psychological needs, they tend to report their choices, behaviours, and actions as substantially motivated or 'self-determined'. They do not need to deal with any unfulfilled needs, but instead, can concentrate on activities that they find attractive or important, such as reading a book or listening closely to the teacher. However, if one or more basic needs remain unfulfilled, the pupils may feel affected by outside pressures or external incentives and may even become preoccupied with satisfying whatever need has not been met, consequently disconnecting from what is relevant to their learning, such as the book or teacher.

SDT is a salient theory to consider with regard to educational practice and policies (Ryan & Brown, 2005). The theory has been applied in a variety of social educational environments and examined in numerous experimental studies, observational research, and SDT-informed interventions. It is concerned with three dimensions: competence (showing one's capacity and abilities through interaction), relatedness (feeling linked to others), and autonomy (believing that one is the originator of one's own behaviour) (Ryan & Deci, 2017). In order to feel self-determined, these three basic needs must be satisfied by the pupil with the help of the teacher. If the teacher is able to assist his or her pupils through effective learning techniques to meet their basic needs, then their sense of satisfaction, self-determination and motivation to learn will increase. Of course, it is acknowledged that this may be difficult for teachers to achieve in practice.

STD was applied to the present study. Its competence aspect corresponded to pupils being motivated to be adept in what they do – in this present case, controlling and mastering their learning of mathematics and answering questions. If a pupil is mainly or exclusively holding up the green card (indicating that they have understood a concept), this should affirm their sense of competence in mathematics, as it indicates that the pupil understands the mathematical concepts and is engaged in learning. Moreover, if a pupil frequently holds up the red card (indicating that they do not understand the concepts), this may increase their

willingness to master what is being taught, as they are acknowledging that the concepts being taught are unclear to them, but they are nevertheless eager to have them explained, so that they can master them.

SDT holds that people develop behaviours and goals as part of engagement, reflecting that they are intrinsically motivated to perform actions. However, it is not necessarily the case that they can develop these goals and behaviour by themselves. For instance, there is the influence of various internal and external elements in the social context when striving to attain these objectives (Deci & Ryan, 1985). In this regard, there are five theories that can be categorised under SDT, including Causality Orientation Theory (COT), Goal Contents Theory (GCT), Organismic Integration Theory (OIT), Cognitive Evaluation Theory (CET) and Basic Psychological Needs Theory (BPNT) (Deci & Ryan, 1985, 2000; Ryan & Deci, 2017). In the present study, the focus is on COT, CET, OIT, and BPNT, which are discussed in the following subsections.

2.8.1.1. Causality Orientation Theory (COT)

The patterns of an individual's behaviour and motivation can be described under COT. This theory reflects the belief that an individual can promote change that corresponds to his or her motivation and behavioural patterns (Deci & Ryan, 1985). Three classes of behaviour, including controlled, autonomous and impersonal, are distinguished under COT. Based on an individual's awareness of needs and goals, choices can be made that are consistent with autonomous behaviour. Individuals who function autonomously are self-initiated in their choices and experiences of behaviour. For example, based on a pupils' awareness of the importance of a concept, they may make the choice to modify their behaviour and actively engage in the learning process. Deci and Ryan (1985) ascertained that individual with an autonomous orientation possess high self-esteem and rarely devalue themselves. This relates to effective and efficient functioning, whereby such individuals are aware of their strengths and weaknesses and are therefore confident (Farmer & Sundberg, 1986; Koestner, 1986).

Controlled behaviours are initiated and controlled according to the environment, in terms of how an individual must behave or act. For example, during a lecture where pupils are not allowed to ask any questions, controlled orientation is the approach, with the adoption of pressurised and extrinsic orientation towards activities. Controlled individuals effectively

focus on an activity. However, in the absence of external controls, persistence does not reflect intrinsic motivation (Koestner et al., 1992).

Impersonal behaviours are those engaged in by people who believe that their initiation and regulation are beyond their control. For example, a pupil who does not show any emotion towards the teacher while learning may be described as experiencing these circumstances, which manifest in negative self-evaluation, low self-esteem, self-derogation, depression, disengagement, etc.

2.8.1.2. Cognitive Evaluation Theory (CET)

Cognitive Evaluation Theory is a subordinate theory of SDT, developed to explain the impact of external factors on internal motivation. This theory promotes two types of motivation: intrinsic and extrinsic. Under CET, it is held that individuals who are intrinsically motivated are affected by their innate need to feel competent, enjoy self-esteem, and be self-determined (Ryan, 1982; Ryan et al., 1983). In this regard, pupils may be intrinsically motivated to learn mathematics, because of their desire for satisfaction and achievement. Hence, intrinsic motivation is driven by factors such as competence, achievement, and responsibility. Conversely, those who are extrinsically motivated are influenced by external rewards, which can be explained from two perspectives. The reward can have a controlled effect, if the individual perceives it as the only reason for participating in an activity. Alternatively, the reward can have an informational aspect, which impacts on the individual's opinion of his or her competence (Vallerand & Reid, 1984). For example, pupils may be forced to study because of external rewards, such as getting a job, or employees may be extrinsically motivated to work, because of monetary rewards. Moreover, CET explains the impact of external factors on internal motivation, as it suggests that when extrinsic rewards are made available to intrinsically motivated people, they can restrict them from doing what they enjoy (Vallerand & Reid, 1984). Overall, levels of motivation may decrease, if extrinsic rewards are allocated for behaviour that is intrinsically rewarded. Hence, intrinsically motivated individuals perform for their own satisfaction and achievement, but if they start believing that they are working for external rewards, they may lose their motivation (Deci & Ryan, 1985; Ryan & Deci, 2000).

2.8.1.3. Organismic Integration Theory (OIT)

In light of CET, as explained in the previous paragraphs, individuals who are intrinsically motivated perform actions because they find them enjoyable, and challenging in themselves. Individuals who have no motivation and no intention of performing any action, however, can be referred to as a motivational (Ryan & Deci, 2000), while external regulation refers to controlling individuals through rewards. Ryan and Deci (2000) state that extrinsically motivated actions can evoke a sense of autonomy in an individual. For example, a pupil may be influenced by external factors, such as rewards from teachers and parents for obtaining high scores. Eventually, they may begin to internalise this behaviour, feeling a sense of pride in gaining high scores, thereby reflecting a sense of introjection and feeling that they should engage in academia. Finally, individuals may integrate this inclination towards academic learning with other facets of their self-concept (Vansteenkiste et al., 2010). Thus, such pupils not only identify themselves as being people who learn and engage in academia effectively, for this identity becomes assimilated and seamlessly integrated with their other self-perceptions. Their behaviour feels increasingly more autonomous, as the individual shifts from extrinsic motivation and introjection through to identification and finally, integration. This process is referred to as ‘organismic integration’, whereupon individuals can experience a sense of autonomy, even when certain behaviour is extrinsically rewarded (Ryan & Deci, 2000).

2.8.1.4. Basic Psychological Needs Theory (BPNT)

In relation to motivation, researchers (e.g., Ryan & Deci, 2017) have identified three basic psychological needs that drive human behaviour, consisting of autonomy, competence, and relatedness. Needs satisfaction is an important factor of an individual’s development, engagement, motivation, and well-being. In addition, it results in improved performance, reduced stress, and fewer turnover intentions (Gagne, 2015). The relatedness component of SDT holds that we are all motivated to interact and connect with others, or be part of our environment. In the context of the current research, the correct use of colour response cards required that the pupils pay attention to their teacher and give immediate feedback, which means that they interacted and engaged directly with their teacher, consequently satisfying their motivation toward relatedness. In undertaking the same task with the colour response cards, pupils also increased their sense of belonging to a larger group with a common purpose, which further satisfied their motivation toward relatedness. The following points describe these three basic psychological needs and their relationship to the present study.

- ***Competence***

Competence is a key concept in pupils achieving success. It includes their effective engagement with the social and academic environment. In the school context, competence includes pupils' ability to perform the requisite activities, as specified by their teacher (Painter, 2011). It should be noted here that pupils are influenced by the quality and quantity of feedback that they receive from their teachers. For example, they tend to attain higher levels of competence after their teachers have given them positive feedback about their performance. Conversely, negative feedback can lower their motivation (Ryan & Deci, 2002). This finding is relevant to the current study, as it suggests that positive feedback from a teacher can increase pupils' perceived competence. Teachers should encourage their pupils to feel competent by selecting activities that are not only challenging, but also, achievable (Elliott et al., 2004).

- ***Relatedness***

Relatedness is another important aspect that needs to be present in the classroom environment. Its promotion in the classroom will depend on how the teacher relates to the pupils. Deci and Ryan (2000) found that the teacher-pupil relationship can influence the pupils' competence. Hence, it will predict how autonomous they can be. Some studies (for example, Maulana et al., 2013; a cross-cultural study) have highlighted the importance of teachers' relatedness and understanding in shaping pupils' engagement. However, this is not enough in itself for pupils to internalise their academic motivation; they also need competence and autonomy in their learning.

- ***Autonomy***

Pupils need to be in control of their own behaviour, thereby feeling more autonomous in the classroom and achieving the desired target of their learning. Deci and Ryan (2000) suggest that self-determination should emphasise pupils' autonomy. These authors are of the view that pupils are naturally and intrinsically motivated to engage in learning, even before they have entered the classroom, which can lead to optimal learning performance. Given that autonomy is an important concept in learning, for the current study, it has been foregrounded, because even though the pupils were instructed to use colour response cards, they could exercise their autonomy by choosing which colour to use.

Based on these factors, the current study is focused on relatedness, autonomy, and competence. The relatedness is salient, in that there was direct interaction between the teacher and pupils in using the colour response cards. In other words, the pupils had to pay attention to the teacher and immediately provide feedback. Using the cards gave the learners a greater sense of control over the learning process, thus indicating their exercising of autonomy. Competence was taken into consideration, because the positive feedback supplied by the teacher in response to seeing the colour response cards had the potential to increase the pupils' perceived level. Feedback can, therefore, enhance pupils' competence, engagement, and interest in learning as well as increasing their levels of awareness (BPNT). It can also influence pupils' behaviour and actively engage them in learning (of relevance to COT). In addition, they may be extrinsically motivated by rewards (OIT), which can eventually lead to intrinsic motivation (CET).

2.8.2 Self-regulation Theory (SRT)

Self-regulation has been described in the literature as “the processes whereby learners personally activate and sustain cognitions, affects and behaviours that are systematically oriented toward the attainment of personal goals” (Zimmerman & Schunk, 2011, p.1). Different theoretical models were developed by the researchers in this context (Panadero, 2017), but the common factor in all the models was goal-setting and regulating the behaviour such as managing time to complete tasks, developing interest towards learning, monitoring the progress in achieving tasks, regulating their motivation, and seeking help when required (Zeidner et al. 2000).

A substantial amount of research (Finders et al., 2021; Galla et al., 2019; Hj Ramli et al., 2018) has been conducted at different levels of education, from kindergarten to the highest pre-college grades, in order to demonstrate the importance of self-regulation for improving educational outcomes. Self-regulated learning has the potential to impact on pupils' behaviour, the ways in which they learn, and their academic achievement. In a study of kindergarten pupils (Morrison et al., in Hoffmann, 2010), it was found that the children who displayed the greatest self-regulation in the autumn term performed better in the reading, vocabulary, and mathematics tests in the spring term than their peers with poorer self-regulation. In addition, Deci et al. (2000) observed that greater self-regulation can be achieved by allowing pupils to learn autonomously and make their own learning decisions. Duckworth et al. (2009) state that

“the early childhood years are important for the development of self-regulation abilities such as attention, inhibition and working memory” (p.3). The reason for this is that in early childhood, children adapt easily to new activities and behaviours. The main advantage of training pupils to regulate their own learning at the beginning of the year is so that an attitude of self-efficacy is embedded (Whitebread, 2000). Chung (2000) points out that the development of self-regulated learning is motivated by both increasing age and the learning environment.

During this process, pupils can develop autonomous motivation, which can help them in effectively control their behaviour. However, the main participants in this study are year one pupils, who are new to school environment. Therefore, they may not be embodying autonomous motivation, and self-regulatory behaviour and also may not have any goals (Deci et al., 1991). They need to be trained in developing these aspects through extrinsic motivation in controlled environment. Therefore, considering the age and the ability to regulate behaviour, SRT may not be applied in this study, where the focus is on motivated behaviour and engagement.

Autonomy is an important factor in theories of self-regulation (Legault & Inzlicht, 2013). It is an internal aspect of self-regulation, as the factors that influence self-regulation have to be developed autonomously by the individuals. Positive relationships between autonomous self-regulation, perceived competence, and performance were identified in various studies (Miserandino, 1996; Fortier et al., 1995). Autonomy can foster superior behavioural performance through developing interest and better cognitive control (Legault & Inzlicht, 2013). In the context of learning, studies have shown the presence of greater interest, higher competence, and improved engagement which led to superior performance in learning among the among the autonomously motivated pupils (Benware & Deci, 1984; Black & Deci, 2000; Deci, 1992; Grolnick & Ryan, 1987, 1989; Ryan & Connell, 1989; Velki, 2011). Ntoumanis (2005) in a similar context, identified that perceived autonomy led to autonomous self-regulation via improved satisfaction among pupils. Similarly, Vallerand et al. (1997) observed that autonomous self-regulation predicted drop-out intentions and actual participation of pupils in a physical education program. Positive associations between autonomy support, autonomous self-regulation, and achievement were identified in the studies aimed at school children (Grolnick & Ryan, 1989; Grolnick et al., 1991). Thus, self-regulation theory highlights the importance of autonomy in regulating the pupils’ behaviour

and improving their behavioural performance by engaging in lessons or learning activities, which is relevant to the current study.

2.8.3 Rationale for selecting Self-determination Theory (SDT) over Self-regulation Theory (SRT)

SDT and SRT both focus on the aspects of self-regulation and autonomy as the core factors in regulating the behaviour and improving performance, hence, both theories can be applied in the context of this study. A comparison between SDT and SRT led to the decision of using the former as the underpinning theory in this study.

In the case of the current study, teacher perceptions of CRCs and their impact on their teaching can influence internal factors, such as pupils' behaviour (academic engagement-disruptive behaviour). The intervention in this study, where colour response cards are used, involved both teachers and pupils. SDT teachers play an important role in motivating and regulating their pupils' behaviour and in supporting their pupils' ability to control their behaviour and engage in learning. Reviewing previous literature, SDT pupils are motivated to change or grow according to three psychological needs, which include competence (improving academic skills by clearing doubts using colour response cards), relatedness (connecting with teachers through colour response cards), and autonomy (taking decisions related to behaviour control on their own). However, SRT focuses on personal management, like controlling thoughts and behaviour to reach goals through autonomous motivation, which is not usually found among young school children. SRT primarily focuses on individual/self-imposed regulations for achieving goals, whereas, in the case of this study, the regulations were triggered by teachers' actions through asking questions and then, the pupils responding by showing a red/green card, paying more attention to the explanation by teacher, or by asking queries, i.e., exhibiting active engagement by promoting autonomous motivation. Another argument for this choice might be that motivation is a sub-element of self-regulation, and this research focuses on that rather than at the wider aspects that SRT includes (e.g., goal settings and self-efficacy). Moreover, this study does not focus solely on the self-regulatory behaviour of the pupils, but also, considers their competence, autonomy, and relatedness and the teacher role to motivate pupil behaviour. Therefore, SDT is deemed to be more relevant to the nature of this study compared to SRT, and hence, it is favoured over SRT as the underpinning theory for this thesis.

2.9. Chapter Summary

This chapter initially discussed the search strategy adopted for the literature review. The following sections then focused on reviewing the pupils' engagement in classroom in the context of Saudi Arabia, followed by the importance of learning, and discussed various aspects of behavioural engagement in learning. Issues relating to pupils' engagement in learning were identified in relation to academic engagement and disruptive behaviour. Furthermore, to systematically categorise these factors of influence, a conceptual framework that identified the relationship between pupils' academic engagement and disruptive behaviour, on the one hand, and their attitudes, the classroom environment, the teacher's role, and teaching approaches, on the other, was developed. In consideration of the factors identified in this framework, active learning approaches were identified as most appropriate for managing academic engagement and disruptive behaviour.

Various active learning approaches were reviewed in relation to managing academic engagement and disruptive behaviour in the classroom. The outcomes were then assessed. It was ascertained that despite the challenges associated with pupils' disruptive behaviour impacting negatively on teachers' ability to teach, manage the classroom, and manage the pupils' learning, there has been a lack of research into identifying and evaluating effective, interactive, and cost-effective teaching approaches, such as colour response cards for managing disruptive behaviour and academic engagement. Regarding which, only one previous study (Hamlin et al., 2008) has compared the use of coloured and white response cards and their impact on pupils' engagement. However, this study was not conducted in a real class, but rather, on a video-recording of a simulated class. Most previous studies have been focused on using response cards as assessment and engagement techniques, but very few have considered colour response cards to manage disruptive behaviour and academic engagement. Moreover, for most of the relevant studies (see Section 2.5, Table 2.1) a single methodology was adopted, using just one instrument, such as a questionnaire or observation. This limited their capacity to collect different types of information from diverse perspectives (teachers, pupils). In addition, multi-purpose interventions, involving a level of pupil autonomy, enabling immediate assessment and feedback from teachers, requiring low investment in terms of cost, and being easy to implement, were not identified in the studies reviewed for managing pupils' disruptive behaviour and academic engagement.

Among the various issues discussed, passive disengagement, low-level disruption as well as aggressive and anti-social behaviour were identified as the most challenging behaviours to be managed in the Saudi context. The role of the teacher is considered of great importance when addressing issues such as academic disengagement and disruptive behaviour. Granted, the role of parents, universities/schools/institutions, and governments is equally important in this regard. However, the current study was aimed specifically at examining the teacher's role in managing academic engagement and disruptive behaviour. To address these issues, active and collaborative learning techniques were identified as being most appropriate for the Saudi context. Specifically, after considering the colour response card approach, it was deemed to be most applicable to this study. No prior research has investigated the impact of colour response cards on academic engagement and disruptive behaviour among primary school pupils in Saudi Arabia. Thus, this was one of the main research gaps identified in this chapter, leading to the formulation of the research questions presented below:

RQ1: How do colour response cards influence pupils' academic engagement and disruptive behaviour in Saudi mainstream primary schools?

RQ2: What are primary school pupils' views of using colour response cards?

RQ3: What are teachers' perceptions of using colour response cards in the classroom, and how does such usage affect their assessment practices and classroom management?

The next chapter explains and justifies the methodology employed in this research. To support the research questions and objectives, two theoretical frameworks including SDT and SRT were reviewed and SDT was identified to be the most appropriate theory to support this study. The next chapter explains and justifies the methodology employed in this research.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

Educational teaching methods are continually under study with the aim of improving, enhancing and adopting them to learners' needs. Accordingly, this investigation focused on the use of colour response cards to promote learner engagement and curb unwanted behaviour. This chapter begins with a discussion and elaboration of the philosophical assumptions and research paradigm. It then justifies the research methods used and gives the reasons for the study's intervention. A mixed-methods design was adopted for this study, with four methods of data collection being applied: observation, a survey, interviews, and recording a journal. In addition, the research design and data collection, analysis, validity, reliability, and ethical issues are discussed in this chapter.

3.2 Philosophical Assumptions

Philosophical assumptions are the criteria that can be applied to design and conduct a research study (Creswell & Poth, 2017; Hathaway, 1995). They guide researchers in formulating the research questions, designing the data collection instruments and analysis, and formulating the relevant theoretical assumptions (Creswell & Poth, 2017). In addition, Creswell and Poth (2017) argue that philosophical assumptions are beliefs that form the framework shaping research from every angle, for example, the research questions, the study itself, the data collection, and choice of theory. Researchers base their hypotheses and hunches on philosophical assumptions, which help create knowledge (Biedenbach & Jacobsson, 2016; Saunders et al., 2016). According to Creswell (2017), whilst these philosophical assumptions may be concealed within the research, they have a huge influence. As a result, the researcher has a responsibility to ensure that the implementation is clearly explained.

This section provides an overview of the researcher's views concerning the nature of reality (ontology), the study of knowledge (epistemology), the role of the researcher's values in this study (axiology), and the techniques used in the research process to complete a set of tasks (methodology).

3.2.1 Ontology

Researchers have defined ontology as an exploration of the nature of reality (Biddle & Schafft, 2015; Coe, 2017; Fung & Bodenreider, 2019; Seth, 2014). Ontology deals with the way in which a researcher perceives reality, using observations to better understand the phenomenon being studied (Anderson & Biddle, 1991; Blaikie & Priest, 2019; Fung & Bodenreider, 2019; Scotland, 2012). Ontology pertains to two possible positions, namely, realism (positivism), associated with objective or quantitative research, and relativism (interpretivism), associated with subjective or qualitative research (Maarouf, 2019).

Positivism is based on the assumption that there is a single truth, and reality can only be investigated using tools that yield reliable and valid empirical evidence (David & Sutton, 2011). From this perspective, my role in the context of this study would be seen as to gain factual knowledge through the use of a quasi-experimental design utilising observational evidence and measurement, because such a process is more likely to be reliable. Moreover, my role can be in a way considered as a data analyst, as I sought to be as independent as possible. For instance, during the classroom observations I limited myself to the role of observer, using structured systematic observation as this allows the researcher to obtain reliable, numerical data from the observation. Furthermore, the analysis of the phenomenon (impact of the CRCs on pupils' disruptive behaviour and academic engagement) was purely based on the observable facts (incidences of target behaviours indicating academic engagement and disruptive behaviour were clearly defined prior to the study and then measured during classroom observations) rather than on the researcher's personal views or opinions. A positivist approach also guided the objective examination of the pupils' perceptions of using CRCs: quantitative data were collected from the survey. Thus, in both these quantitative aspects of the study, I sought to examine reality by yielding empirical evidence through scientific methods (Brock & Mares, 2014; Bryman, 2016; Zyphur & Pierides, 2019). Consistent with this quantitative approach, descriptive and inferential statistics were used to analyse resulting data.

As positivism relies on outcomes, claims, and explanations in a specific study, it is multi-dimensional in nature. Consequently, it is argued that positivism is not fundamental and cannot support a core definition (Donnelly, 2019). For instance, in the context of this study, one of the core objectives was to analyse the teachers' experiences of using CRCs, and its impact on their assessment and classroom management practices, thus reflecting the subjective nature of the phenomenon being studied. In contrast to positivism, relativism (interpretivism) assumes that

the nature of reality cannot be understood via scientific methods, but may be interpreted according to an individual's personal views through interaction (Brock & Mares, 2014; Scotland, 2012; Seth, 2014). From a different context, I can perceive that a classroom is a socially constructed place, where human interests can influence the phenomenon. In such situations, I believe it is important to extract the meanings by exploring the totality of each individual case (teacher's experiences and views on using CRCs), rather than seeking hard facts, which may limit the extent of analysis. I also consider that it is important to incorporate the stakeholders' perspectives (e.g., teachers' views on using CRCs) in order to study the whole phenomenon (impact of CRCs on pupils' disruptive behaviour and academic engagement) as they are also the part of intervention in the social world (those who enable the use of CRCs in classrooms). Therefore, it is important to collect rich data from all the stakeholders, which are then analysed to develop the ideas. Unlike with the positivistic stance, I had to involve myself in the study in order to collect rich and quality data, where I could use my personal opinions or observations in studying the phenomenon. The application of this ideology may be noted from the semi-structured interviews with teachers, who were exposed to a classroom learning environment that differed from the norm, in order to invoke their personal views. This provides further explanation of the outcomes of human interactions with the environment. Consequently, the nature of the reality (truth) is interpreted by different people from varying perspectives, suggesting that there is no single distinct truth, as it varies according to individual interpretations (Coe, 2017).

Based on my personal observations and views, both positivist and interpretivist ontological positions were deemed appropriate in this study, due to the nature of the research questions in relation to different philosophical stances. The ontological perspective adopted in this study enabled outcomes to be measured and established through quantitative research methods, while also considering individual experiences through qualitative methods. Observing learners in the classroom and recording learners' engagement provided evidence of the effectiveness of using colour response cards. Conversely, the implementation of an interpretivist approach gathered experiences of truth through various interactions, revealing diverse viewpoints.

3.2.2 Epistemology

Epistemology is a philosophical view that explains how knowledge is interpreted in society. According to Thyer (2010), the driving force behind the analysis and interpretation of research data are based on epistemological views of the world. While these perspectives might not be implicitly identified in all research, the influence will have high impact on the conclusions drawn. I adopted a mixed method approach (both qualitative and quantitative approach) for this study, reflecting a pragmatism epistemological stance. The mixed methods approach is defined by Creswell and Creswell (2017) as the collection and combining of both quantitative and qualitative data in a study. This approach is akin to triangulation in that both mixed methods research and the former involve integrating more than one methodological approach.

With regard to the first and second research questions (RQ1 and RQ2), objectivism was applied to measure pupils' disruptive behaviour, while simultaneously observing their academic engagement by means of colour response cards in the classroom. Therefore, I needed to treat the change in pupils' disruptive behaviour and academic engagement as the objective knowledge for studying the phenomenon. The reality was investigated via quantitative methods (observations, surveys). However, in response to the third (RQ3) research question, I considered that each teacher would have a different experience regarding and opinion of the effects of using colour response cards in mathematics lessons. In the current study, knowledge was constructed by interpreting reality from the opinions and perceptions of teachers, who were interviewed about using colour response cards in the classroom. Therefore, I needed to treat the teachers' views as subjective knowledge.

3.2.3 Axiology

The role of the values held by the researcher, the assumptions made in the research about what is worthwhile, and the influence of these assumptions on the research process is referred to as axiology (Frels & Onwuegbuzie, 2013; Inuigushi & Mizoshita, 2012; Maggetti et al., 2013). It is important to acknowledge the researcher's axiological stance, in order to explain and justify his or her decisions in the course of a research study (Creswell, 2009).

As discussed later (in Subsection 3.3.2), in a mixed methods approach, the research approaches and strategies associated with the ontological and epistemological assumptions were deployed in this study. These approaches and strategies were likewise influenced by the

researcher's values (Freis & Onwuegbuzie, 2013), which were considered to be important in the present study, because of the high emphasis placed by the researcher on inclusion for all. Some pupils can disengage from the teaching in school and possibly disturb others, meaning that teachers are obliged to spend time dealing with this behaviour to the detriment of all. Thus, the researcher sought to develop an intervention that would permit true inclusion, with no one excluded, with all those within a teaching setting being heard and treated equally. In this way, all pupils would be able to engage with the teaching and hopefully, reach their full potential.

Furthermore, the role of women and girls within the scientific research context is now changing. Being a self-motivated female, the researcher is strongly motivated towards gender equality, with girls being assisted to achieve their true potential. This, in particular, was a driving force behind the current study. In her work with pupils, the researcher considered that they needed to be given a voice early on in life, which would impact on them in the long term. This corresponds to SDT, which argues that autonomy is an important psychological need for motivation. In the context of the current study, autonomy has the potential to allow pupils to feel in control over their own goals and behaviour, and thus, to feel self-determined. It was hoped that an observational approach would enable them to demonstrate this, where the pupils are observed for behaviour changes in a natural setting (classrooms). In addition, the researcher's values in relation to care and responsibility are implied throughout all aspects of this research. These are values that the researcher believes should be promoted in every setting, so that communities of all sizes can function healthily, with everyone feeling that they matter. This attitude of care and responsibility even extended to the participating teachers in the intervention, especially during the classroom observations and interviews.

To summarise, the researcher's human values, for example, care, inclusion, and self-responsibility influenced every aspect of the research tasks and activities. These values are of importance to the researcher, and she considers that the approaches being investigated could easily be integrated into educational policy and rolled out to all schools, in order to promote teaching effectiveness and pupils' sense of responsibility.

3.2.4 Methodology

Methods refer to the approaches and procedures undertaken by the researcher to collect and analyse data (Cohen et al., 2007). They can also be considered as the techniques used in the

research process to accomplish a set of tasks. These support each other in the process of acquiring and analysing information and identifying outcomes, thereby addressing the research questions and achieving the research objectives (Henning et al., 2004). A research methodology is “the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes” (Crotty, 1998, p.3).

According to Punch and Oancea (2014), methodology is the process defining the approach to inquiry in identifying what can be known in a research study. It is considered essential to identify the research activities required to address the research questions, determining the criteria for collecting the data, reviewing the collected data, and as a result, enhancing the research contributions (Snyder, 2019). The selection of methods will depend on various aspects, such as the knowledge to be acquired, the nature of the inquiry, the available tools, the available time and resources as well as the expertise in implementing the methods (data collection and analysis). In broad terms, methodological approaches can be divided into quantitative and qualitative methods or a combination of both in the same study, known as a mixed methods approach.

In order to address the research questions effectively, this research was established on a pragmatic paradigm, which is closely linked to the mixed methods approach. Hence, the use of observations, surveys, interviews, and journal record in the data collection process. These methods are explained and justified in detail in this chapter (see Subsections 3.3.2, 3.3.2.1, and 3.3.2.2). Meanwhile, the next section discusses the research paradigm in relation to the aims and objectives of this study.

3.3 Research Paradigm

Philosophical stances (ontological, epistemological) and methodological assumptions (qualitative, quantitative, mixed methods) can be used to design a research framework, known as a research paradigm. This will underpin the way in which the research questions are addressed (Coe, 2017; Fellows & Liu, 2015; Morgan, 2014; Roth & Rosenzweig, 2020). Coe (2017) defines paradigms as being derived from the world as is through investigations, carried out on the basis of philosophical and methodological assumptions. Morgan (2014, p.1049) specifically defines paradigms as “...shared beliefs within a community of researchers”. The

next subsection presents the pragmatic paradigm adopted for this study, together with the researcher's rationale for doing so.

3.3.1 Pragmatism

Pragmatism can be viewed as a practical, rather than theoretical, approach. In particular, it is defined as a process of identifying the best practices for solving a research problem (Robson & McCartan, 2016). The association between pragmatism and mixed methods has been supported by various researchers in the formulation of research paradigms (Feilzer, 2010; Tashakkori & Teddlie, 2003). According to Tashakkori and Teddlie (2010, p.14), “the a-paradigmatic stance [which] states that for many studies conducted within real world settings especially in applied fields, paradigms or conceptual stances are unimportant to practise”. The advantage of pragmatism as a paradigm for this current study was that it helps to avoid the dichotomy between positivism and interpretivism by employing multiple research approaches (i.e., quantitative and qualitative). These assumptions can be used to interlink epistemology and ontology, where positivism (objectivism) and interpretivism (subjectivism) are pragmatically connected (Creswell, 2014; Tashakkori & Teddlie, 2003). Creswell (2014) agrees that the pragmatic paradigm can offer freedom and flexibility in the use of methods and procedures to enhance understanding, depending on the researcher's views and values.

3.3.1.1 Application of Pragmatism in This Research

The reason behind adopting pragmatism as a paradigm for the current study was that it would help avoid the division between interpretivism and positivism by applying more than a single research approach (i.e., qualitative and quantitative). Furthermore, adopting a pragmatic paradigm for the research design was anticipated to enhance the strengths and minimise the weaknesses of each perspective by integrating both qualitative and quantitative approaches (Creswell, 2014). For the present research, integration was addressed through data triangulation, as will be explained later.

Since the pragmatic position is compatible with the mixed methods approach (see Subsection 3.3.2 for clarification), as applied in this study, it enables the freedom and flexibility to choose methods and techniques that correspond to the different types of data collected in response to the research questions. The current research involved incorporating elements of the positivist paradigm, with the aim of establishing whether there was a causal relationship

between the variables. Furthermore, whilst it is possible to ascertain how pupils are behaving by observing them, it is not possible to observe teachers' actual internal decision-making process. This can only be interpreted from what they report and by observing how their decision-making affects what they do in the classroom. Accordingly, a positivist approach was adopted to identify the impact of colour response cards on pupils' academic engagement and disruptive behaviour, whilst an interpretivist one was deployed to assess the impact of colour response cards on teachers' decision-making and classroom management. That is, different strategies were required to gather the teachers' perceptions. Additionally, from a constructivist stance, the teachers' views of the effects of the intervention were collected.

3.3.2 A Mixed Methods Approach

The selected methodology was mixed methods. Both qualitative and quantitative approaches to address the corresponding research questions (Bryman, 2016; Mackey & Gass, 2016; Punch & Oancea, 2014). In this process different qualitative and quantitative methods are combined into a single study for studying the phenomenon from various perspectives (Johnson and Onwuegbuie, 2007). It is, therefore, clear from these definitions that mixed methods studies involve collecting and analysing both quantitative and qualitative data (Creswell & Plano-Clark, 2011; Teddlie & Tashakkori, 2009), thereby allowing for triangulation, i.e. applying different methods of data collection and integrating the data in relation to the topic being studied (Creswell & Plano Clark, 2011) under unbiased philosophical considerations.

Hence, the mixed methods approach permits the integration of different research perspectives into the same study, with a view to addressing questions that demand both objective and subjective knowledge (Bryman, 2016; Creswell & Plano Clark, 2011). Campbell and Fiske (1959, in Johnson et al., 2007) pioneered the idea of triangulation, which is defined as multi-operational, with more than one method being used in a validation process. According to Johnson et al. (2007), the mixed methods approach centres on the philosophy of pragmatism, which recognises both theoretical and practical aspects of research, drawing conclusions based on multiple viewpoints and diverse perspectives, positions and standpoints, which include qualitative and quantitative research.

3.3.2.1 Quantitative Approaches

The quantitative research approach is concerned with specific hypotheses, where the data numerical and mostly includes numerical measurements about the various aspects of phenomenon being investigated (Mackey & Gass, 2016). The quantitative methods adopt positivistic-deductive approach and assumes the existence of objective reality which needs to be empirically investigated (Rahman, 2017). Different techniques such as questionnaires, structured observations and experiments may be considered in a quantitative study (Mackey & Gass, 2016). The main advantage of the quantitative approach is that the findings can be generalized across the populations, as these studies usually include large samples, which are representative of the population being studied (Cresswell, 2014). This approach may lead to an enhanced view of reality as the data are more objective. However, there are certain disadvantages associated with quantitative approaches, as they are not effective in analyzing how social reality is shaped. The shared meanings of social events may also be neglected, with no in-depth understanding of the underlying meanings being required or available. Moreover, details are disregarded in favour of obtaining a holistic picture (Rahman, 2017). It should be noted that as the quantitative approach adopted in this current study was exploratory in nature, it is not conclusive, since much of the data are generalised, and understanding of the reasons for and further explanations of the responses are limited.

3.3.2.1.1 Application of Quantitative Approach

In order to address the objective questions in this study, data were collected through structured observations, selected according to the research question and paradigm underlying the study. Observations may be categorised into three types, depending on the procedure adopted, including: structured (for example, counting the number of events), unstructured (for example, making notes, developing narratives from observation), or semi-structured (for example, taking notes and categorising specific data) (Bryman, 2016; Cohen et al., 2011). In this present study, quantitative data from structured observations were collected using classroom observation checklists, which were then analysed to ascertain changes in the pupils' disruptive behaviour and academic engagement (RQ1). The justification for this type of observation is due to the simplicity and clarity with which changes in behaviour patterns could be recorded by so doing. Structured observation is an ideal instrument for collecting data when measurable outcomes are of interest, as it includes ticking noticeable behaviour pattern traits on a checklist to evaluate, in this case, the impact of using colour response cards.

Surveys were used as a quantifiable method of data collection, in which 101 pupils participated to assess pupils' perceptions of the value of CRCs in the intervention (colour response cards) in response to RQ2. One of the reasons for conducting a survey was the instrument's ability to provide an overview of the learners' views on the intervention at a general rather than individual level. The use of quantitative methods gave insights into overall and average changes in behaviour (disruptive behaviour and academic engagement) when using the colour response cards (see RQ1 and Subsection 3.6.3 for more detail), however, they did not give insights into reasons for those changes. Therefore, more interpretative, qualitative methods, were also needed.

3.3.2.2 Qualitative Approaches

A qualitative approach is one that does not usually involve the use of digital systems to collect and analyse data (Punch & Oancea, 2014; Rahman, 2017). This is because qualitative data analysis depends on interpretive rather than statistical methods (Punch & Oancea, 2014; Robson & McCartan, 2016). In qualitative studies, the research questions, strategies, procedures, and data collection methods depend on the participants' opinions (Creswell, 2014).

Qualitative research was effectively applied in this study, in that it allowed for interpreting different facets of the reality reported by the teachers and how this could be interpreted in different ways (see Subsection 3.2.1 on ontology), according to an analysis of human experiences. This led to the development of new ideas that might not have been assessed using quantitative research methods (Mackey & Gass, 2016; Rahman, 2017; Wilson, 2014). However, one disadvantage of qualitative research is that the sample sizes are often small, and the data collected will depend on different people's subjective views of the research problem or phenomenon. Moreover, bias can be introduced, thereby affecting the credibility of the study (Cohen et al., 2011; Creswell, 2014; Rahman, 2017). However, the credibility of qualitative research can be enhanced by triangulating it with quantitative methods, i.e., comparing the data from both approaches (Creswell & Plano-Clark, 2011; Teddlie & Tashakkori, 2009), as is the case in this present study. Such an approach can give a more complete understanding of the research problem (Creswell, 2014).

3.3.2.2.1 Application of Qualitative Approach

The qualitative data collection in this study took place through interviews, whereby individual experiences, beliefs, and motives were explored using open and closed questions. The purpose of these interviews was to respond to RQ3, regarding the teachers' views of using colour response cards. Thus, semi-structured interviews were conducted, and journal records were collected in response to RQ3. Such an approach was expected to provide a complete understanding of the research problem (Creswell, 2014). The mixed methods approach permitted the integration of different research perspectives into the same study, with a view to addressing questions that demanded both objective and subjective knowledge (Bryman, 2016; Creswell & Plano Clark, 2011).

Creswell (2003) identified three strategies for sequential research: sequential explanatory, sequential exploratory, and sequential transformative. For the present study, a sequential explanatory strategy was adopted to explore phenomena relating to the impact of deploying simple colour response cards (green or red) on classroom behaviour, in order to address RQ1 and RQ2, which incorporated quantitative (structured observations, surveys), followed by qualitative methods (semi-structured interviews, journal records). In sequential mixed methods designs, "the researcher conducts a qualitative phase of a study and then a separate quantitative phase or vice versa" (Tashakkori & Teddlie, 1998, p.46). A mixed methods approach can be categorised into various strands, including qualitative dominant, equal status, and quantitative dominant, based on the weight of the selected qualitative and quantitative methods employed (Johnson et al., 2007); for the current study, both methods received equal balance to answer the research questions.

3.4 Pilot Study Design

In this research, a pilot study was conducted prior to the main study, in order to evaluate whether the selected research instruments would gather the appropriate data. The pilot study is defined by Lucienne et al. (2009) as a way of improving the research approach to reduce the potential for any issues that might impact on the quality or validity of the results. Consent was obtained from the pupils' parents, teachers, and the pupils themselves in advance of their participation. The pilot study was conducted in four modes of collection: an observation checklist to rate disruptive behaviour and academic engagement; a survey to obtain information on the pupils' perceptions of using colour response cards; semi-structured interviews; and

journal records to assess the teachers' perceptions of using the cards, as explained in the following subsection.

3.4.1 Participants

The participants were pupils enrolled at a primary school located in Jeddah, Saudi Arabia. The sample for the pilot study included nine pupils aged between six and seven years. Purposive sampling was applied to the experimental groups, with one class assigned to the intervention and the other to the control group. The pilot study was conducted in April 2018. Nine pupils were selected as a part of intervention group from an intervention class of 29 pupils, and another nine pupils were selected as a part of control group from another control class with 29 pupils. Parental permission and consent from the pupils and teachers were collected (by signing the consent form to indicate informed consent). All procedures were approved by the University of Reading's Institute of Education Ethics Committee. The inclusion criteria comprised: (a) Enrolled in year one of a primary school, (b) Attending mathematics lessons in a state-sector school setting, and (c) The teacher reporting behaviours that could be targeted in an observation checklist and willing to attempt the colour response card intervention to address those behaviours. All pupils in the intervention class were given training in the use of the colour response cards.

3.4.2 Materials and Measures

Direct behaviour ratings (DBR), as explained below, consist of brief ratings of pupils' behaviour (Fabiano et al., 2017). These ratings were employed in this study to collect pupils' academic engagement and disruptive behaviour scores in the classroom. A co-observer (a teacher in the same school, but of a different subject) was recruited, because she was familiar with the pupils and her participation would increase the reliability of the observations. The co-observer was trained in the study process, informed of its objectives, and consented to participate in the co-observer role. Towards this end, the researcher provided a behavioural skills training session (i.e., modelling the use of colour response cards and rehearsing their implementation, giving information, and demonstrating feedback on pupils' performance) to instruct the assistant in how to collect the data. Accordingly, the co-observer completed a 40-minute video-training session to orient her to the DBR measurement approach (Chafouleas et al., 2007) and invite her to practise DBR.

To illustrate the above, the observer might tick the box for disruptive behaviour or academic engagement to indicate that these behaviours were observed in a pupil. The scores were recorded using observation checklists (as shown in Appendix A) by the researcher and co-observer at five-second intervals for a period of 15 minutes per pupil. Scores for disruptive behaviour and academic engagement were calculated for every pupil in each session, as explained in detail in Subsection 3.6.3.2. The average score (total scores of all sessions/number of sessions) for disruptive behaviour and academic engagement was calculated for every pupil in each class (using '0' for blank boxes and '1' for ticked boxes in SPSS).

As part of the pilot study, feedback survey questionnaires (as shown in Appendix D) were distributed to the 29 pupils in the intervention class, whereupon their understanding of the questions was assessed (with regard to the wording and their ability to answer the questions). The mathematics teacher read out the questions to the pupils, who were subsequently asked to choose from the scales for each question. In addition, journals (see Appendix C) were provided for the teachers in the intervention classes. Journals are record-keeping books, wherein the intervention class teachers were expected to enter their experiences of using colour response cards in class each day. In addition, specific experiences of pupils' behavioural changes, observed in the classroom, were recorded, and a pilot interview was conducted with one teacher. The procedures followed in the pilot study are explained in the following subsection.

3.4.3 Procedure

In the pilot study, the behaviour of the selected 18 pupils was assessed by the researcher and co-observer at three stages: pre-intervention, introduction, and established conditions, using the observation checklist. The first set of observations (pre-intervention) was collected during one classroom session, a week before the colour response cards were introduced. The pupils used these colour response cards for three weeks. The second set of observations (introduction) was collected starting from the week in which the colour response cards were used by the pupils, across three sessions (one session per week). After three weeks, the pupils continued to use the colour response cards for another week. Following the fourth week of usage, a third set of observations (established conditions) was conducted during one classroom session. In sum, these pilot study observations were undertaken in April 2018 over a period of four weeks in different sessions.

In addition, all 29 participants in the intervention classes took part in a feedback survey on their perceptions of using the colour response cards. A journal record was also given to the teachers at the beginning of the experiment, so that they could share their experiences of how the colour response cards had affected their decision-making, such as repeating questions or altering lesson plans. The journal records were written by the teachers at the end of each mathematics intervention class. A detailed sampling frame of the pilot study is presented in table 3.1.

Table 3.1:

Sampling frame and procedure of the pilot study

Stage	Intervention group	Control group	Timeline	Journal records
Pre-intervention	Nine pupils' behaviour was assessed by the researcher and a Co-observer	Nine pupils' behaviour was assessed by the researcher and a Co-observer	One week before introducing CRCs to pupils (Week 1)	The Journal record was given to the class teacher
Introduction	Nine pupils' behaviour was assessed by the researcher and a Co-observer	Nine pupils' behaviour was assessed by the researcher and a Co-observer	During the first weeks of introducing CRCs to pupils (Week 2-3)	The Journal record was updated after the class for four weeks by the teacher
Established	Nine pupils' behaviour was assessed by the researcher and a Co-observer	Nine pupils' behaviour was assessed by the researcher and a Co-observer	After four weeks of using CRCs (Week 5)	The Journal record was updated after the class for four weeks by the teacher
Feedback survey	All 29 pupils in intervention class participated in the survey	N/A	After the completion of the experimental study (Week 6)	The Journal record was collected by the researcher at the end of four-week study
Semi-structured interviews	The class teacher who used CRCs was interviewed (N=1)		After the completion of the survey (Week 7)	N/A

At the end of the intervention study (after recording the behaviour ratings in the established conditions stage), as abovementioned, a pilot interview was conducted with one teacher. The questions used in the interview were then modified for the main research study, based on the teacher's responses. It was important to build a good relationship with the teachers and to stress anonymity and confidentiality, so that they would be forthcoming in the interviews and in providing journal entries. Following the pilot interview, both the interviewer (researcher) and interviewee (teacher) concluded that the interview was satisfactory, with no major issues being encountered.

3.4.4 Results

The results of the pilot study were examined to see whether the process and methods applied were reliable and effective, with no problems being identified in rating the observation checklist. It was clear that both the teachers and pupils found it easy to use the colour response cards, without encountering any difficulties. Moreover, the teachers did not report any concerns about using the colour respond cards in their mathematics teaching sessions. However, one question in the survey was discarded, because many pupils asked for it to be explained again. In addition, as the pupils were seated in different places in the classroom, it was decided that badges should be used to identify the participants effectively in the observations but in such a way as to ensure pupils did not know who was the main focus for observation (see Section 3.6.3)

3.5 Main Study Sampling and Sampling Criteria

Sampling refers to the way in which relevant participants are selected for data collection (Cohen et al., 2011; Creswell, 2014). In fact, research quality is enhanced when appropriate sampling is performed (Cohen et al., 2011). The two main sampling techniques applied in research are probabilistic and non-probabilistic (Cohen et al., 2011; Edmonds & Kennedy, 2017). According to Edmonds and Kennedy (2017), there are five types of probability sampling: stratified, cluster, systematic, multistage, and simple random sampling. The lattermost is described by Schilling and Neubauer (2017) as a means of ensuring that everyone has an equal opportunity to participate in a given piece of research.

In contrast, non-probability sampling can take the form of convenience or purposive sampling (Edmonds & Kennedy, 2017). With the former, the reasoning behind the selection of

participants is their accessibility for the researcher (Thomas, 2013). However, this type of non-probability sampling has several limitations, including an increased risk of selection bias and unrestrained influences (Edmonds & Kennedy, 2017). Conversely, purposive sampling involves the selection of participants according to the needs and purposes of the research (Cohen et al., 2011).

In the current study, different sampling techniques for the main study were used at different stages of the research. In selecting the schools, the researcher chose a purposive sample (Edmonds & Kennedy, 2017) (taking into consideration their ease of accessibility for the researcher). To select the classes for the experimental design, the researcher chose simple random sampling (Edmonds & Kennedy, 2017), because this would result in the most representative sample. However, there was no need to apply any selection process to the teachers, because all those available were involved in the study. In contrast, the selection of pupils was purposive (Edmonds & Kennedy, 2017). The following subsections explain these selection processes in more depth.

Sample size concerns the number of people who participate in a study (Cohen et al., 2011; Kumar, 1999), which will depend on the purpose of the study (Cohen et al., 2011; Lichtman, 2014) and the number of people available to take part. In this research, the sample size for both the quantitative (observation, survey) and qualitative (interview, journal record) methods was necessarily small, because it was limited by the number of mathematics teachers available, the size of their classes, and the number of pupils that the researcher could observe at any one time. The main limitation of a small sample size is that the findings cannot be generalised. The experimental phase involved a sample size of nine pupils in each of five classes (3 of which formed the intervention group, and two the control group). Nine pupils were considered as the optimum number for observation, as it would not have been possible to observe the behaviour of all the pupils in a real-time classroom setting (Schermer & Fosker, 2019; Bell et al., 2019).

3.5.1 Study Context: Jeddah

3.5.1.1 Selection of Schools

The researcher emailed the Ministry of Education in Jeddah to explain the nature of the research, provide any necessary details, and seek permission to carry out this study in schools in the city. The Ministry of Education was made aware of the fact that the study would examine

the disruptive behaviour and academic engagement of pupils in schools. The researcher received a list of 10 potential schools (from a total of 205 schools, catering for 105,000 pupils), which could be approached for this purpose. However, no justification was provided for this list, although it is possible that the schools were purposively selected by the Ministry as they were aware of the nature of the research. According to Bhardwaj (2019), purposive sampling aligned with the purpose of a study, also known as deliberate or judgement sampling. The listed schools were all located within a 15-kilometre radius of the researcher's residence.

Having received this list of potential schools, the researcher sought permission from all 10 via email, explaining the research in detail. However, only three of these schools responded to the email with permission for the researcher to initiate the data collection process. Nevertheless, it should be noted that one of those three schools later declined to participate, with no reason being given. Therefore, just two participating schools remained. An agreement was reached to engage in the research once their head teachers had agreed on the timeline.

The selection of two public sector schools is therefore justified using deliberate or judgemental sampling in this study: School A and School B, both located in Jeddah at 5.4 and 5.8 kilometres, respectively, from the research base. Jeddah is the second largest city in Saudi Arabia. The intervention was conducted during the first term of the Saudi academic year, 2018. The school programme commences in September and continues until June, divided into two terms to accommodate the weather conditions. The setting for the experiment consisted of the schools' regular classroom environment and hours: 7:00 am to 12:30 pm. School A had a head teacher, two supervisors, and two mathematics teachers in year one, while School B had a head teacher, two supervisors, and one mathematics teacher in that year.

Both schools are housed in two-storey buildings with more than 20 classrooms. Where the observations took place, all the pupils were seated at their respective desks in the classroom. Each pupil sat at a single desk. The seating arrangement in classroom is arranged as five rows by four columns of desks. The classrooms had appropriate lighting to facilitate the pupils' learning, and an air-conditioning facility, because a hot classroom can lead to poor concentration and mood. In total, at the time of conducting this study, School A had 594 pupils, 24 teachers, and 12 other staff, whilst School B had 489 pupils, 20 teachers, and 10 other staff.

3.5.1.2 Selection of the Classes

After receiving detailed information about the research procedure, the head teachers at both schools selected classes to participate in the study (Edmonds & Kennedy, 2017). In School A, the head teacher selected three classes, with two classes allocated to the intervention group and the control group, while in School B, one class was allocated to the intervention group and one to the control group.

3.5.1.3 Selection of the Teachers

The two Schools had a total of three mathematics teachers and four general education teachers in year one. As there were only two mathematics teachers in School A and one mathematics teacher in School B, there was no need to select a sample of teachers; all who were available agreed to take part in the study. The three teachers were interviewed and completed the journal records in the course of their work.

The teachers in both schools were female, due to cultural and religious sensitivities in Saudi Arabia (gender segregation in education and across society in general; (see subsection 1.3.1.). Aside from mathematics, the teachers in both schools taught a variety of subjects within a single classroom. All three teachers had a bachelor's degree in education, having undertaken further training in a Jeddah university. Their teaching experience consisted of the following: Rawan had four and a half years' experience, Amal had five years' experience, and Muna had seven years' experience. Therefore, it was ascertained that the three teachers had a similar level of experience and education to be able to contribute effectively to the research study.

3.5.1.4 Selection of Pupils

In this study, three intervention classes were involved: the first with 33 pupils, the second also with 33 pupils, and the third with 35 pupils. Meanwhile, the two control classes both contained 33 pupils. Out of those classes, 45 pupils consented to be observed during the observation procedure: 27 in the intervention, and 18 in the control classes, with 9 pupils in each class. Moreover, in each class, nine pupils were selected for observation. Three of the nine in each class was selected on the basis of exhibiting poor academic engagement and highly disruptive behaviour (as judged from a mathematics assessment and observation by the researcher respectively). The teachers in each class selected the remaining six pupils to give a range of academic achievement. Hence, this was a purposive sample, selected according to the needs

and purposes of the research (Cohen et al., 2011). The teacher then taught each class using the colour response cards. All pupils who were involved in the intervention classes consented to complete the survey ($n = 101$) after using the colour response cards.

All pupils in the five classes selected to participate in this study were aged 6-7 years. All the lessons were delivered in Arabic, including subjects such as mathematics, life skills, and art, with all assessment being conducted by the teachers.

3.6 Research Design and Data Collection

A research design represents the overall plan of a study that shapes how the research questions are going to be answered through making use of particular instruments and procedures (Punch, 2013). A quasi-experimental design, which included an experiment without random assignment, was employed in this study. Experimental research involves a systematic and scientific approach that follows a set of logical procedures. Shadish et al. (2002) identified different terms that refer to experimentation, including ‘experiment’, ‘randomised experiment’, and ‘quasi-experiment’. An experiment can be understood as a process where an intervention is deliberately introduced to observe its effects. A randomised experiment refers to a technique in which units are assigned to receive treatment via a random process, whilst in a quasi-experiment, units are not randomly assigned to conditions.

In experimental and quasi-experimental research approaches, the researcher deliberately manipulates one or more variables, while controlling and measuring any changes to others. There are two main potential variables of interest: independent and dependent variables. Independent variables are variables that are under the researcher’s control, but influence the outcomes. Conversely, dependent variables are caused or influenced by independent variables; they consist of the research outcomes or results. In general, the goal is to investigate whether manipulating the independent variables leads to changes in the dependent variables (Cohen et al., 2007; Creswell, 2003). In this study, the independent variables consisted of using or not using colour response cards with an entire class (intervention and control groups, respectively) and the times at which the observations were carried out (pre-intervention, introduction, established conditions). Finally, the dependent variables consisted of the observers’ ratings of pupils’ behaviour: specifically, disruptive behaviour and academic engagement in the classroom.

The type of experiment selected will correspond to the nature of the study and the assignment of units within it. In this context, the factors included in an experiment can help differentiate the type conducted and its adoption in studies. Hence, an experiment may include a pre-intervention design, a treatment and control group, and the random assignment of study participants. Meanwhile, a quasi-experiment, as employed for this research, lacks one or more of these design features. In fact, an increasing number of quasi-experimental designs are appearing in the education literature, involving whole classes and sometimes even entire schools (Hunt & Goetz, 1997; Slavin & Madden, 1995), as a means of assigning participants to conditions.

The strategies adopted to execute the research activities are presented in the research design, which was aimed at defining the approaches and methods of addressing the research questions and research problem as well as reporting the results (Creswell, 2014; Creswell & Plano Clark, 2011; Kumar, 1999). This study took the form of a sequential explanatory mixed methods design, involving quantitative (structured observation, surveys) and then, qualitative (semi-structured interviews, journal records) methods. This design is described in brief in Subsection 3.6.1 and examined in more detail in the following subsections. As the initial thought was that there would only be a few pupils in the participating schools, a multiple baseline design was adopted as a suitable experimental design for a small number of participants.

Correspondingly, quantitative research is dedicated to collecting numerical data, which can be used for analysis through various scientific techniques. Given the current research context, both qualitative and quantitative methods were deemed appropriate for implementation for the data collection. Quantitative data were collected using classroom observation checklists, which were analysed to ascertain changes in pupils' disruptive behaviour and academic engagement. Moreover, questionnaires were administered to assess the effectiveness of the intervention (colour response cards), from the perspective of the pupils. In addition, semi-structured interviews and journal records were utilised to collect qualitative data from the teachers, consisting of their perceptions of the colour response card approach.

The majority of studies investigating the impact of various teaching strategies (reviewed in Chapter Two) on pupils' behaviour have focused on primary and secondary school pupils. However, there has been very little research of this nature on kindergarten pupils. In addition, most of the abovementioned studies have relied on questionnaires as the sole method of data

collection. Because the analysis of pupils' behaviour demands detailed investigation, a mixed methods approach can be effective for collecting various types of data via techniques such as observations, surveys, interviews, and journal records.

3.6.1 Data Collection Process

3.6.1.1 Summary of Data Collection to Address the Research Questions

With regard to addressing the first research question (RQ1), a quasi-experimental design was adopted, comparing the response card intervention with a control group (the independent variable). For this purpose, classroom observation checklists were deployed to analyse and ascertain changes in disruptive behaviour and academic engagement among the pupils (the dependent variables). This process reflects a quantitative approach using observations as a research strategy. Similarly, a quantitative research strategy involving survey questionnaires was adopted to address RQ2, which involved capturing pupils' views of using colour response cards. That is, the questionnaires were administered to assess the social validity of the cards as an intervention, specifically from the pupils' perspective. The observational data were analysed using ANOVA to identify differences between the groups of pupils (Intervention and Control), and descriptive statistics were used to analyse the survey data. The control and intervention classes experienced a normal teaching day, apart from the researcher's presence.

Finally, semi-structured interviews and journal entries were adopted as part of a qualitative research methodology to address RQ3, which was formulated to investigate the teachers' perceptions of using colour response cards in the classroom, as well as the way that such usage affected their assessment practices and classroom management, and most importantly to better clarify why they felt the change occurred in pupils' behaviour. These semi-structured interviews were conducted with all the participating teachers, on the school premises, with the collected data being subsequently analysed thematically.

3.6.2. Quasi-experimental Design Addressing RQ1

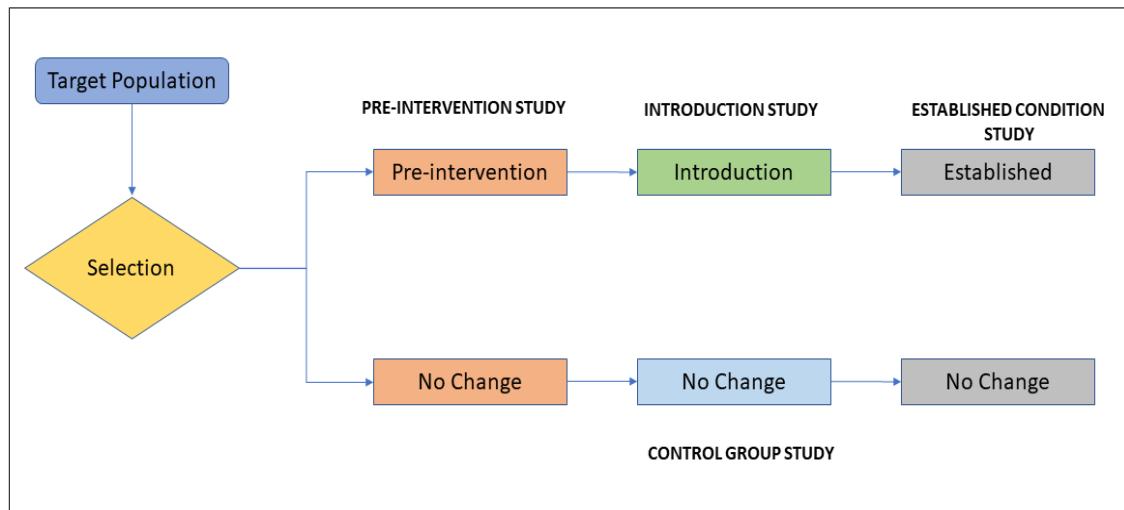
How do colour response cards influence pupils' disruptive behaviour and academic engagement in Saudi mainstream schools?

In order to address the above objective question, a quasi-experimental design was adopted, with explanation for this set out below.

As indicated in the literature, there is value in investigating disruptive behaviour and academic achievement through observation. The researcher investigated the impact of colour response cards on learners' disruptive behaviour. Two groups were involved, an intervention group and a control group. The first group experienced the colour response cards technique while the second did not. Moreover, use of a control group could equally help analyse changes in pupils' academic engagement and disruptive behaviour that might not be due to the colour response cards, but rather, to some other factor (for example, the pupils having more classroom experience or being a little older). In addition, the inclusion of a control group increases confidence and reliability, such that any behavioural changes in the intervention group could, indeed, be attributed to the use of colour response cards. Therefore, use of a control group can help researchers analyse findings from different perspectives and explore the impact of an intervention in more depth. Furthermore, data were collected at three time-points: before the intervention, during the intervention, and after the intervention. This study was designed to take place in nine observation sessions over a total of 12 weeks (one week for the pre-intervention; three weeks for the introduction, two weeks for the established conditions), for three days each week in School A and School B. First, before introducing the colour response cards, the pupils were observed by the researcher for one week, using an observation checklist to identify their disruptive behaviour and academic engagement (pre-intervention). Second, the colour response cards were introduced into the classroom, and the pupils were observed using them over a period of three weeks (introduction). Third, the teachers continued to use the colour response cards for a further two weeks, after which, observations were conducted for two weeks to identify any changes in the pupils' disruptive behaviour and academic engagement (established conditions), as shown in Figure 3.1.

Figure 3.1:

Final study design with three testing periods for the two groups (intervention and control)



3.6.2.2 Procedure for Collecting the Quasi-experimental Data

The main research study (intervention) was conducted during the first term of the Saudi academic year, 2018. The academic year in Saudi Arabia is divided into two terms: the first running from September to mid-January, and the second from the end of January to the beginning of May.

The pupils selected from School A and School B used the colour response cards for two weeks following the intervention, as opposed to one week in the pilot study. An increase of one week was identified as necessary for the pupils to start feeling comfortable with using the cards, which is essential for observations under established conditions. The same observation checklists (see Appendix A) were used in the pilot study to observe disruptive behaviour and academic engagement in all three stages, including the pre-intervention, introduction, and established conditions.

In addition, a pre-defined gap in the data collection after the introductory study (shown in Figures 3.2 and 3.3) was imposed, during which no observations were conducted, as the pupils needed time to familiarise themselves with using the colour response cards as well as ensuring that the novelty of using the colour response cards on the first few occasions did not affect the results. For example, the pupils might have been very keen to use the cards at first, but less keen thereafter. After the pupils had become accustomed to the cards, the observations

were continued for two weeks (in the established conditions stage), during which any changes in the pupils' academic engagement and disruptive behaviour were monitored and recorded.

Figure 3.2:

Experimentation process in School A

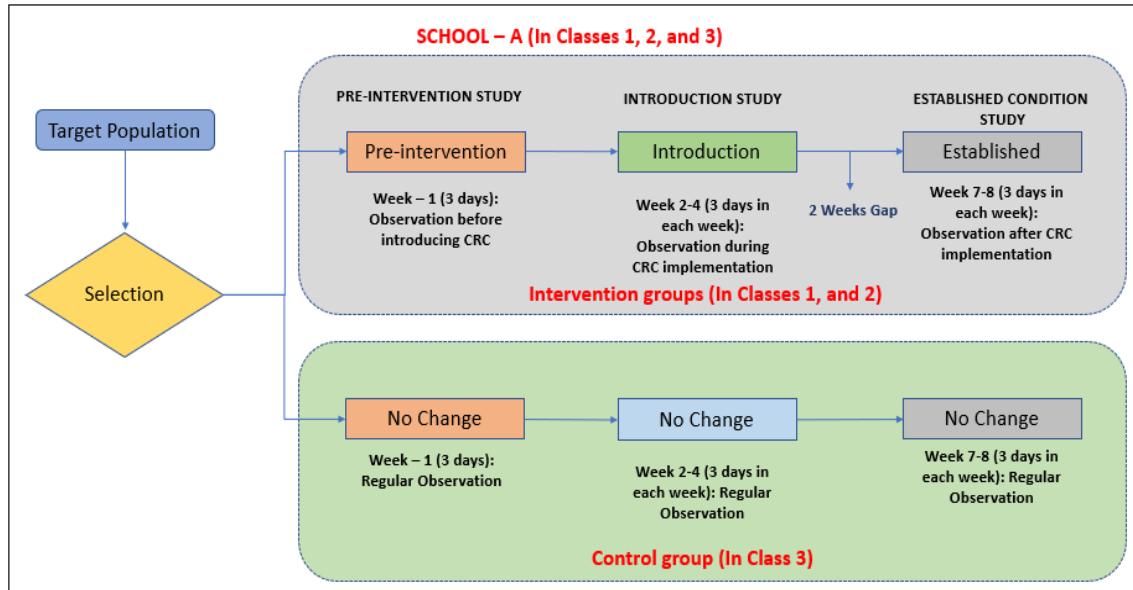
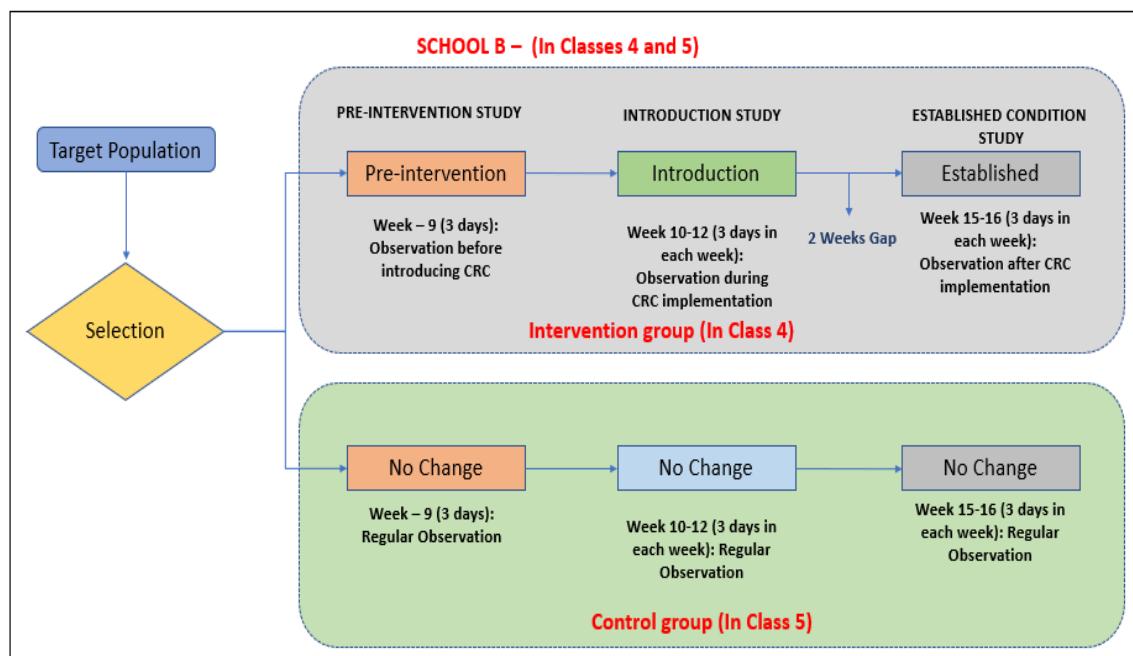


Figure 3.3:

Experimentation process in School B



The following subsection explains the four methods used to collect the data, which include structured observation, surveys, semi-structured interviews, and journal records.

3.6.3 Data Collection Using Structured Observation to Address RQ1

How do colour response cards influence pupils' disruptive behaviour and academic engagement in Saudi mainstream schools?

The pupils' behaviour was recorded throughout the experiment. The purpose of observation is to examine certain events that participants might feel uncomfortable discussing in interviews (Cohen et al., 2011). The impact of colour response cards on pupils' behaviour (disruptive behaviour, academic engagement) was studied with the aid of an observation checklist, thereby structuring the observation into pre-determined categories, and counting the events (Bryman, 2016).

There are some advantages to using quantitative observation, as addressed by Campbell (2017), who points out that “one aspect of quantitative observation that differentiates this method from qualitative observation is the ability to generate descriptive, comparative, and predictive statistics” (p.296). In addition, observations are simple to conduct and do not require any technical knowledge. Moreover, the data collected in observations can be used to test hypotheses. Further, observations are the only effective tools in contexts where the participants might not be able to give information about their behaviour via verbal means (Becker & Geer, 1957; Nickols & Ayieko, 1996). Observation also offers an effective means of collecting data concurrently with an event, without disrupting the event itself. The methods oriented to the discovery of knowledge are relatively unobtrusive and very flexible. Analysing the behaviour of people is the only way to obtain reliable data in some situations (Queirós et al., 2017). Given these affordances, observation was considered to be the appropriate tool for recording pupils' behaviour in the classroom.

While this method of collecting data have various advantages, there are also certain disadvantages, for instance, the many types of behaviour displayed by participants might not be open to observation. Moreover, it might not be possible for the observer to record all behaviour observed at a particular point in time. In addition, observers can have erroneous perceptions, thereby affecting the reliability of the observational data (Becker & Geer, 1957; Nickols & Ayieko, 1996). Besides, using a structured observation schedule is regarded to be more efficient than naturalistic observation because the researcher is focused on particular behaviours which, thus, reduces time and expense. Moreover, this research tool could help the observer to exert control over the environment (classroom) (Price et al., 2017).

However, these limitations can be minimised by adopting an effective structured observation schedule, where issues such as accuracy, faulty perceptions, etc. can be addressed (Cohen et al., 2018). Furthermore, in this study, the observation was conducted by a co-observer and the researcher which is considered to minimise the flaws of the research method mentioned above. The co-observer was a researcher's colleague and the participants were familiar with her. Inter-rater reliability was conducted with the observation data and the results are presented in Table 3.5. Also, during observation, pupils were wearing badges, and to facilitate the observation procedures, the observed girls were provided with badges of different colours (as mentioned in section 3.4.4). The difference in the colour was not remarkable and the badges were used only during the first session as the observers could identify the target girls for observation without the badges.

One particular disadvantage of observation is reactivity: the subjects being observed may react differently and alter their behaviour when observed (Knoefler et al., 2012). For example, pupils may be more conscious of their behaviour, if an observer is present. To minimise the potential Hawthorne effect (Chiesa & Hobbs, 2008), referring to participants' awareness of being studied and the possible impact of that awareness on their behaviour, the researcher ensured that the participating pupils were familiar with the researcher before starting the study. Observers undertaking on-site observation have sometimes found that pupils in the setting try to interact with the researcher, or behave in such a way that it is obvious they are reacting to the presence of an observer. In these situations, it is advisable to keep the researcher's interaction with the research participants to a minimum acknowledgement, and also, to get pupils accustomed to being observed.

The class teacher initially introduced the researcher to the pupils, and they were aware of her presence in the classroom. Before the observations began, the pupils were eager to talk to the researcher, asking her name and engaging in light conversation. However, as the researcher attended numerous sessions with the co-observer, who taught other subjects in the same classroom, the pupils became acquainted with the researcher, which led to a more relaxed relationship developing between her and them. As a result, the researcher's presence did not appear to affect the pupils once the observations were underway. During the intervention, the researcher and co-observer sat at the front of the class, next to the teacher, because it was the only place available.

To achieve the research objective of assessing how the use of colour response cards affected pupils' disruptive behaviour and academic engagement, the researcher needed to use structured (quantitative observation) in conjunction with a time-sampling schedule, which involved recording the behaviour patterns observed during the specified time periods (Meany et al., 2007). However, this was often impractical in that it required a dedicated observer. For this reason, time-sampling is often used instead of a dedicated observer to estimate behaviour. There are two types of time-sampling: partial-interval recording (PIR) and momentary time-sampling (MTS) (Meany et al., 2007). The former involves recording an occurrence, if the target response occurs at any point during an interval (see Subsection 3.6.3.2 for more details).

In an extensive literature review on systematic direct classroom observations of pupils, Fabiano et al. (2017) was found to be the only study that addressed academic engagement and disruptive behaviour in primary school pupils, providing a clear definition of these behaviours. The adoption of Fabiano et al.'s (2017) approach was for developing the observation schedule to record behaviours. Disruptive behaviour is defined by Fabiano et al. (2017, p.5) as "pupils' action that interrupts regular school or classroom activity, such as: being out of the seat, fidgeting, playing with objects, acting aggressively, talking/yelling about things that are unrelated to classroom instruction". Meanwhile, Fabiano et al. (2017, p.5) further define academic engagement as active participation, "such as writing, raising hands, answering questions, talking about the lesson, listening to the teacher, reading silently, or looking at instructional materials". In their study, Fabiano et al. (2017) used systematic direct observations (SDO) across three primary school pupils to address academic engagement and social behaviour. This type of observations is based on measuring operationally defined behaviours using standardised procedures during predetermined times and places (Hintze et al., 2002).

However, while SDOs are considered effective in school settings (Volpe et al., 2005), they were not used in the current study because they are costly and therefore difficult to administer repeatedly at the rate that is typically required in behavioural progress monitoring assessments in schools. In the present study, a colour response card strategy was used in the classroom, because it is simple, low cost, and can be implemented by many subjects simultaneously.

Instead of using systematic direct observations, Blatchford's (2002) approach to classroom observation was adopted, as he and his fellow researchers are key experts in the

observation of primary school-age pupils and their observational procedure was comprehensive, involving categories for time spent in different social settings (individual behaviour, interaction with the teacher, interaction with a classmate) and in different work settings (individual, small group, or whole class). Blatchford's observation schedule is based on Croll's (1986a) highly influential publication on classroom observation. Blatchford applies different instruments, observation systems, and data analysis methods (see Subsection 3.6.3.2 for more details). The lesson plan used during the observations is explained in the next subsection.

3.6.3.1 Procedure: Lesson Plan

The teacher began the lesson by telling the class a story related to what was about to be taught, and then, moved on to the core concepts of the lesson. The teaching strategy included the concepts of cooperative thinking, diction, active learning, dialogue, discussion, and critical thinking. Mental and concept maps were prepared by the teacher, in which the pupils participated. Details of these activities and the role of the teacher and pupils are presented in Appendix L1.

In order to maximise the benefits of implementing colour response cards, a teacher's preparation plan was designed for each unit, which helped them to focus on specific aspects of their teaching as well as the ways and instances of using colour response cards in the classroom. Accordingly, an example of a teacher's preparation plan is provided in Appendix L2, which outlines the objectives with respect to a unit or lesson, the tasks to be achieved, teaching tools, and criteria for success. A lesson plan is then provided in Appendix L3, relating to a unit of work ('Geometric Shapes and Fractions'), wherein the learning objectives and outcomes are outlined. Pupil assessment activities, for example, short and long texts, note-writing, homework, and self-evaluation are included.

Two teaching strategies were adopted by the teachers, which included 'think and share' and 'concrete representational abstract', as shown in Appendix L4. The 'think and share' approach focuses on an individual's thoughts about a given problem, whilst then sharing and discussing the solutions with peers. In contrast, the 'concrete representational abstract' strategy is dedicated to building the concept for pupils in successive stages: from concrete to semi-concrete and then abstract. In adopting these strategies, teaching aids such as animation,

pictures, banknotes, and smart devices were used in this study, as relevant to the lesson being taught. Lastly, an assessment plan was developed (see Appendix L6) to evaluate the pupils' learning and knowledge. A sample lesson plan for counting money is included in Appendix L6.

3.6.3.2 Procedure: Collecting the Observation Data

The observation focused on two behavioural aspects (i.e., disruptive behaviour and academic engagement), drawn from Fabiano et al. (2017). As the mathematics lesson lasted for 45 minutes, both the intervention and control groups were observed on each of the three days of the week when there were mathematics classes. The observations conducted by the researcher and co-observer took place in blocks of five seconds each, interspersed with five-second gaps to allow events to be recorded. These periods were timed using a stopwatch. After each block of 10 observations, attention was switched to the next pupil on the list (Blatchford, 2005). Sample checklist items were provided for disruptive behaviour and academic engagement, as shown in Appendix A.

The method employed to observe the targeted pupils' behaviour is an example of instantaneous sampling. That is, instances of pupils' disruptive behaviour or academic engagement were noted at predetermined time intervals. The researcher recorded the behaviour at five-second intervals for a period of 15 minutes per pupil (five seconds for observation, followed by a five-second break, amounting to one observation every 10 seconds, six observations per minute, and 90 observations in 15 minutes). The observers ticked the respective boxes (academic engagement/disruptive behaviour), according to the behaviour observed for each pupil. The average scores for each pupil's academic engagement and disruptive behaviour were calculated for every session using SPSS, with 0=empty box and 1=ticked box. The setting for the experiment consisted of regular classrooms provided by the schools. All the pupils were seated at a desk in the classroom, and the lighting was good enough to facilitate the observations conducted by the researcher. These observations were conducted at times when all the pupils were in class for a mathematics lesson. The choice of mathematics as a subject has already been explained in Chapter One (see Subsection 1.3.2).

It is important to note that the three participating teachers were all given instructions on how to implement the colour response cards in the intervention classes. A six-step

demonstration was to be given by the teacher after introducing each step. The teachers would instruct their pupils as follows on how to implement the colour response cards.

Step 1. At the beginning of every classroom session, the pupils were asked to ‘prepare for class as a routine (i.e., individual pupils placed the green and red cards in front of them on the table). The teacher then initiated the lesson by making the request: ‘Please raise your colour response cards, if you are ready for class.’

Step 2. In the first classroom session, the pupils practised using the colour response cards when the teacher asked them questions and required them to respond.

Step 3. During the class, the teacher posed either open-ended or closed-ended questions, based on the content prepared before class.

Step 4. After the teachers posed the questions, the pupils responded with the colour response cards: green, if they knew the answer, and red, if they did not. As mentioned above, they were expected to raise one card.

Step 5. The teacher would call a *pupil’s* name as an invitation to whoever raised a green card to elaborate upon their answer. If a large number of pupils raised red cards, the teacher would repeat the question, give an example, or go back a few stages to give more explanation. In order to encourage pupil participation and communication, the teacher could decide to use another method, such as asking the pupils to raise a green card to help their peers who had raised a red card, thereby promoting cooperation between peers.

Step 6. The teacher collected the colour response cards at the end of the lesson and stored them in the classroom.

3.6.4. Data Collection Using a Survey to Address RQ2

What are pupils’ perceptions of using colour response cards in the classroom?

In order to address RQ2 to identify the pupils’ perceptions of using colour response cards, feedback surveys were conducted. Surveys can help gather distinct answers to specific questions (Brace, 2018). The main aim of the survey in this current study was to discover the pupils’ views of the colour response card intervention, which could then help the teacher and researcher to refine the use of the cards. Feedback from pupils is considered as an important element of effective instruction, as confirmed by Chan et al. (2014).

There are different types of survey or questionnaire, depending on the instrument's structure (structured, semi-structured, open survey) (Brace, 2018; Cohen et al., 2007). As the main goal of the survey was to gather pupils' perceptions after applying the intervention, the use of structured surveys was deemed suitable for answering RQ2. Structured questionnaires can be used to collect clear numerical data and frequency responses, which can then be incorporated for effective statistical analysis. Structured online questionnaires have various advantages, such as reducing the cost and time involved in data collection. They can also be used to reach a wide audience in a short time (Cohen et al., 2011). However, a few drawbacks of questionnaires have been identified, such as bias and the collection of incomplete or inaccurate data (Brace, 2018). Therefore, in order to increase reliability, it was acknowledged that it was necessary to test the Cronbach's alpha value in this present study.

The survey was designed in two sections: the first was dedicated to gathering the pupils' background information (school, class), while the second included four statements to elicit levels of agreement from the respondents: '1) the colour response cards helped me learn; 2) helped me eat my lunch; 3) helped me to listen and be quiet with the teacher; and 4) helped me to join in with the teacher'. These items were adapted from Menzies et al.'s (2017) study. Regarding the measurement scale, a simplified Likert-type measure was adopted (described in the next subsection), because it is very reliable and easy to use (Cohen et al., 2000). As mentioned earlier, the present study was conducted to collect data on pupils' use of colour response cards across a whole class, in order to gather feedback from the respondents.

3.6.4.1 Collecting the Survey Data

This section gives an overview of how the pupils' perceptions were gathered, in relation to the impact of using the intervention tool (i.e., colour response cards) on their disruptive behaviour and academic engagement. In December 2018, at the end of the intervention, a survey was carried out among 101 year one pupils in School A and School B. The primary goal of this survey was to support the data and results from the three intervention classes. To make it easier for the pupils, the surveys included just four questions (see Appendix D).

The survey was designed to take around 15 minutes to complete. It was first reviewed by the pupils to ensure that they understood the questions on using colour response cards. The majority of the pupils presented green cards, which reflected that they understood the survey questions. Specifically, a five-point scale was selected (1= strongly agree; 5=strongly disagree)

for the sake of clarity and ease of use (see Appendix D). To facilitate the process for the pupils, icons ('smileys') were used for the scale, instead of number ratings. The teachers read out the questions and the pupils were asked to rate each questionnaire item on the scale. They were also given an opportunity to ask any questions that they wanted about the survey. The researcher subsequently sealed the completed surveys in an envelope to ensure the pupils' privacy before leaving the classroom. The pupils were also given a piece of candy as a reward for completing the survey. The procedure applied to conducting the survey is explained in the following steps.

Step 1. The researcher met with the teacher and introduced the pupils' survey questions.

Step 2. The researcher asked the teacher to separate the tables into two groups, A and B (see Figure 3.4, below). This would ensure that the pupils did not copy from their peers. The survey was then conducted, starting with Group A.

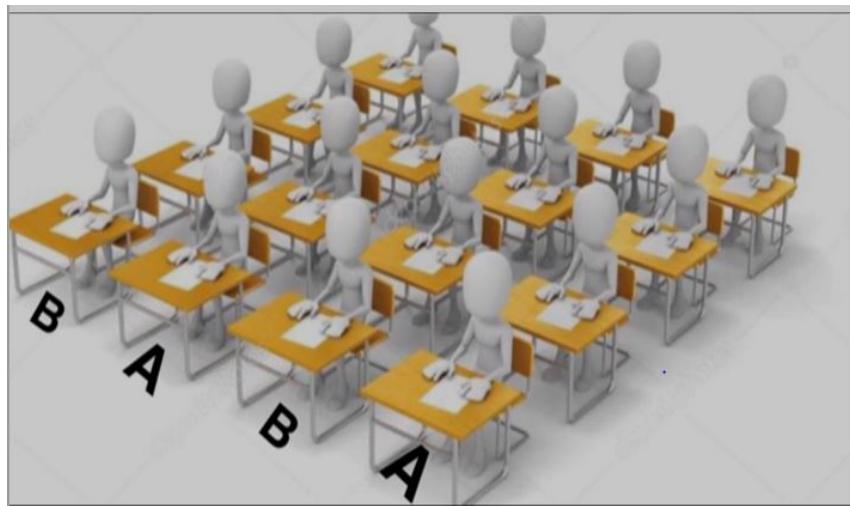
Step 3. The teacher first read out the questions and then, asked the pupils to select an item on the scale for each question.

Step 4. While the pupils in Group A were completing the survey, the pupils in Group B were assigned other tasks, such as reading stories or completing homework. After Group A had finished, the teacher collected the papers and handed out the survey questionnaire to Group B (see Figure 3.4 below).

Step 5. The researcher collected the completed survey questionnaires and put them in an envelope.

Figure 3.4:

Classroom seating arrangements for Groups A and B during the survey



3.6.5. Data Collection Using a Semi-structured Interview to Address RQ3

What are teachers' perceptions of using colour response cards in the classroom and how does this usage affect their assessment practices and classroom management?

There are three possible types of qualitative interview, and these will vary according to the degree of structure (Punch, 2009): structured, unstructured, and semi-structured. A structured interview consists of each interviewee being asked the same, closed-ended questions. Generally, questions in a structured interview are specific and offer the interviewees a range of possible answers (Bryman, 2001). This kind of interview is objective and easy to analyse, unlike unstructured interviews, which contain open-ended questions, are flexible, and are intended to explore issues in depth but require extensive time and effort. Structured interviews were not deemed appropriate for this study, because they would have reduced the researcher's flexibility, given that they offer no opportunity for follow-up questions (Nachmias & Nachmias, 1996; Punch, 2009). Conversely, given that the teachers had limited time for interviews, an unstructured method would not have been sufficiently focused. Thus, they would not have helped the researcher achieve the interview aims in the restricted time available. In contrast, semi-structured interviews include both open- and closed-ended questions, but not all the questions are prepared and formulated in advance. As a result, such interviews combine the benefits of both structured and unstructured interviews (Kidder et al., 1986). A semi-structured interview can be understood as an exchange between at least two people concerning a subject of mutual interest, while at the same time encouraging discussion of interpretations and an

interchange of points of view (Cohen et al., 2011). The structure of a semi-structured interview may be determined by the researchers/interviewers themselves, allowing them to pre-formulate the questions and introduce new relevant questions during the process (Brinkmann, 2014; Cohen et al., 2011).

Hence, semi-structured interviews provide a flexible technique, which allows different questions to be asked during an interview in response to the interviewees' replies. They give the interviewer a chance to probe for further information. The main benefit of individual semi-structured interviews is that they allow the interviewees to express their thoughts more freely than they could in a group approach. Additionally, one-to-one interviews were practical for this study, as it would have been difficult to bring a number of teachers together at the same time during the school day.

3.6.5.1 Procedure: Collecting the Semi-structured Interview Data

The qualitative analysis in this study provided the opportunity to complement the numerical data, with explanations that either concurred with or dispute the findings regarding these data. The interviews were scheduled for three mathematics teachers in the three intervention classes, and were intended to last between 15 and 20 minutes, using a semi-structured approach. Therefore, the responses from one teacher would not be influenced by another. The interviews were conducted orally and audio-recorded, being subsequently transcribed and translated into English. The interviews took place in the teachers' schools after the intervention phase was completed (at the end of December 2018).

The interview questions (see Appendix B1) were carefully designed to collect the data, so as to be able to address the research questions and achieve the research aims. The questions at this stage were focused on the various strategies implemented by the teachers during lessons, and whether they adopted these immediately after presenting a question to the class. The interview questions were adapted from the existing literature (for example, Cakiroglu, 2014), as they were relevant to the present study context. All questions were designed to extract detailed information from the teachers. In addition, a few follow-up questions were asked, based on the responses given by the participating teachers, where these were of relevance to the current study. It should be noted that the journal records were also used by the teachers to help recollect their experiences while answering the interview questions.

Open questions were posed to probe for depth and to extend the interviewees' responses, giving them space to talk about their own experiences. The purpose of the interview questions was to help address the research questions, and the responses were subsequently classified into themes, directly relating to RQ3. The researcher began the interviews with a question about the weather or some other 'irrelevant' topic, following Brown's (2001) advice on helping to create a more relaxed atmosphere.

3.6.6. Data Collection Using a Journal Record to Address RQ3

What are teachers' perceptions of using colour response cards in the classroom and how does this usage affect their assessment practices and classroom management?

The journal records helped to improve the quality of the data by including the teachers' experiences and feedback for the data analysis (see Appendix C for the journal record headings). A detailed record of all transactions, incidents, and observations during an event can be recorded in journals. They can be useful for reviewing the transactions of an event, and also, for comparing those transactions using other methods. However, when comparing data from journal records with data collected about the same event at a later date, there can be bias, depending on the method of data collection. For example, whilst data about a meeting or event may be collected using a questionnaire and journal records from video recordings, at a later stage, the data collected in a questionnaire might not necessarily resemble those collected in the video recordings, and so accurate comparison is not always possible, thereby leading to bias. However, journal records can serve as an approach to recollecting transactions during events, thereby helping to enhance responses during the collection of data with a different method after an event is over. In this study, journal records were referred to during the interviews, enabling the interviewees to recollect specific information about their experiences of using colour response cards in the classroom.

3.6.6.1 Procedure: Collecting the Journal Record Data

The teachers were asked to complete a journal record after each intervention class. This record contained three feedback headings (Plan, Instruct, Evaluate) to help the teacher comment on her changes during the lesson, such as whether she had changed or repeated a question, or given more explanation. For example, when the teacher asked a question, if the majority of the pupils raised red cards, it meant that they did not understand the question. Thus, the teacher would

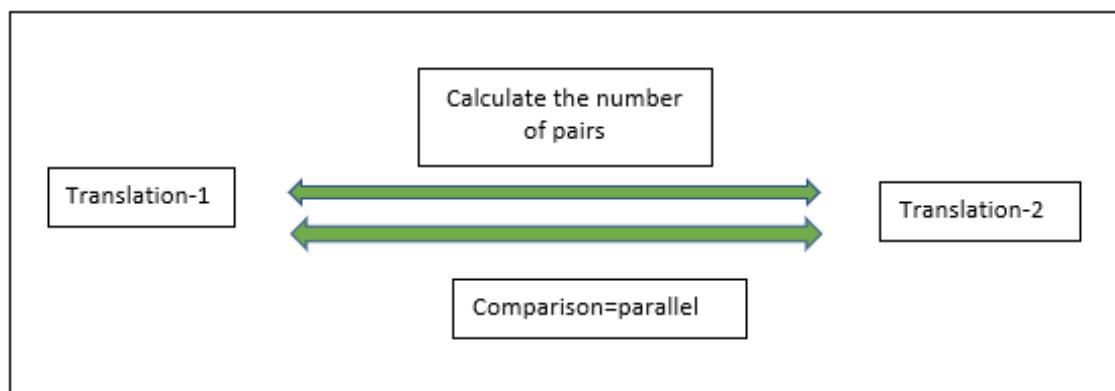
change it or provide more detailed explanation. This reflected the teachers' decision-making capabilities. The changes observed in this process were recorded by the teachers in the journal records after the lesson, in order to be analysed later by the researcher.

3.6.6.2 Procedure: Translation

The interview and journal transcripts were translated from Arabic into English. To ensure the quality, validity and reliability of the data, an effective translation mechanism was adopted. This translation mechanism was divided into two procedures. The first focused on the parallel translation mechanism, whereby a human reference translation was used, with two versions of translated transcripts by two different translators being compared for similarity (Hassan et al., 2018; see Figure 3.5). This process is also referred to as sentence-pair comparison, because sentences in two different translated versions are compared (Ramesh & Sankaranarayanan, 2018). The second procedure was a back translation mechanism, applied to assure the user of the quality of the translated transcripts by questioning the translation from the target to the source language (Elayeb et al., 2018). The back translation mechanism is depicted in Figure 3.6.

Figure 3.5:

Back translation mechanism

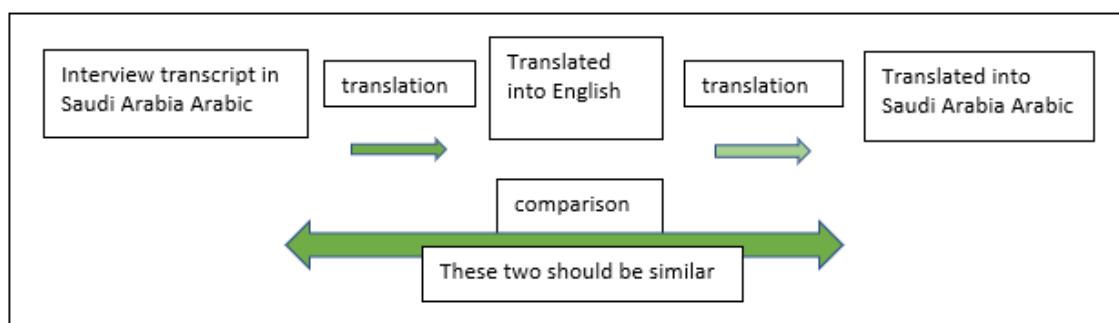


The original instruments (interviews, journal records) were in Arabic. The transcripts were initially translated into English by a professional Arabic-English translator, using the parallel translation mechanism to ensure the similarity and correct meaning of each word in English (Johnson et al., 2018). This approach helped maintain the pattern of meaning or semantic pattern of the translation (Malá & Brůhová, 2018).

Thus, both the researcher and a professional translator were involved in translating the interview transcripts and journal records. After translation, both versions were compared to determine whether they were similar in their meaning and semantics. If the translated versions were observed to be parallel or similar, then the translated version was adopted. However, if they were dissimilar, both the researcher and professional translator would work on the transcripts to sort out the differences, until they had achieved similar wording and meaning between the two versions. Nevertheless, issues such as low translation accuracy can arise in parallel translation (Ramesh & Sankaranarayanan, 2018). To address this challenge, a back translation mechanism was also applied, whereupon the monolingual data (for example, interviews transcribed into English) were translated back into the source language (i.e., Saudi Arabic). The results of comparing both translated versions (in the source language) should be parallel before the initially translated version can be accepted (Edunov et al., 2018; see Figure 3.7).

Figure 3.6:

Back translation



Aspects, such as the accuracy and quality of data, can be ensured in this comparison (Edunov et al., 2018). The procedure was conducted in three steps. Firstly, the transcripts in Saudi Arabic were transcribed into English. Secondly, the transcribed English language version was transcribed, once more, back into Saudi Arabic. Thirdly, the initial Saudi Arabic version was compared with another version developed in the second step. It was subsequently ascertained that both versions were similar. The sampling frames for data collection using different approaches is presented in 3.2.

Table 3.2:*Sampling frame and procedure of the main study*

Stage	Intervention group	Control group	Timeline	Journal records
Pre-intervention	Nine pupils' behaviour was assessed by the researcher and a Co-observer from each class: two intervention classes of 33 pupils each in School A and one intervention class of 35 pupils in School B	Nine pupils' behaviour was assessed by the researcher and a Co-observer from each class: one class with 33 pupils in School A; and another class with 35 pupils from School B	one week before introducing CRCs to the pupils (week1)	The Journal record was given to the three class teachers
Introduction	Nine pupils' behaviour was assessed by the researcher and a Co-observer from each class: two intervention classes of 33 pupils each in School A and one intervention class of 35 pupils in School B	Nine pupils' behaviour was assessed by the researcher and a Co-observer from each class: one class with 33 pupils in School A; and another class with 35 pupils from School B	During the first three weeks of introducing CRCs to pupils	The Journal record was updated after the class for eight weeks by the three teachers
Established	Nine pupils' behaviour was assessed by the researcher and a Co-observer from each class: two intervention classes of 33 pupils each in School A and one intervention class of 35 pupils in School B	Nine pupils' behaviour was assessed by the researcher and a Co-observer from each class: one class with 33 pupils in School A; and another class with 35 pupils from School B		The Journal record was updated after the class for eight weeks by three teachers
Feedback survey	All 101 pupils in the intervention classes in both schools participated in the survey	N/A		The Journal record was collected at the end of eight-week study
Semi-structured interviews	The class teachers who used CRCs were interviewed (N=3)		After completion of the survey (Week 7)	After completion of the survey

3.7 Case Study analysis

The case study method was employed as part of the quantitative research to investigate in depth of the impact of colour response cards on pupils. Merriam (2009) points out: “A case study is an intensive, holistic description and analysis of a single entity, phenomenon, or social unit” (p.46). Based on feedback from the mathematics teacher regarding a few pupils who behaved differently, some in each group were selected for detailed observation in a case study analysis. Accordingly, during the observation of nine pupils in each class, a few pupils from each group were selected by the researcher for a detailed analysis of changes in their disruptive behaviour and academic engagement. Regarding which, Pupil 5 from the ‘Grape’ group (see Chapter Four, Subsection 4.2.5) was observed to examine the effect of using colour response cards on pupils’ behaviour. In addition, multiple cases were analysed to assess pupils’ perceptions of using the colour response cards. For example, Pupil 5 (Chapter Four, Subsection 4.2.2.4) from the ‘Apple’ group was examined to assess changes in disruptive behaviour, and Pupil 4 (Chapter Four, Subsection 4.2.3.4) from the ‘Cherry’ group was observed, in order to assess changes in academic engagement. Multiple cases were deemed useful for analysing the impact of colour response cards on academic engagement and disruptive behaviour from different perspectives.

3.8 Data Analysis

3.8.1 Analysis of the Observational Data

Before identifying a suitable data analysis technique, it is essential to explore the distribution of quantitative data. For this purpose, statistical tests, including the Shapiro-Wilk, skewness, and kurtosis tests, were used to test for normality and validate the assumptions made. In addition, non-parametric tests, including the Mann-Whitney (see Appendices E, F) and Friedman (see Appendix G) tests were used to analyse the data.

To analyse the data relating to RQ1, ‘How do colour response cards influence pupils’ academic engagement and disruptive behaviour in Saudi mainstream schools?’, two-way mixed analyses of variance (ANOVAs) were utilised. The frequency of particular behaviour displayed in the intervention and control classes was tested for differences between the intervention and control groups. In addition, changes over time were used to compare the mean differences between groups (intervention and control), where one factor is a ‘within-subjects’,

and the other is a ‘between-subjects’ one in SPSS. Analyses of variance are a type of parametric statistical test that compares means. Specifically, ANOVA allows for the statistical comparison of means for different groups to ascertain the difference between them.

Larson-Hall (2010) points out that ANOVA involves a repeated or non-repeated measurement procedure to examine the differences between groups, divided according to independent and dependent variables. In this current study, mixed ANOVA was used for both repeated measures and independent groups. Subsequently, the main goal of a two-way mixed procedure is to investigate whether there is: (a) a significant main effect of either factor, or (b) a significant two-way interaction between the independent variables (factors) on the dependent variable (Field, 2013; Larson-Hall, 2010). In this study, the independent variables (factors) were Time and Group, and separate ANOVAs were conducted to analyse data on the two dependent variables: disruptive behaviour and academic engagement.

As stated above, ANOVA is an example of a parametric test, requiring a number of assumptions to be met for a mixed procedure to be applied. These assumptions may consider factors, such as the study design having no significant outliers in any of its cells, normal distribution in the dependent variable, homogeneity of covariance, variance on the dependent variable, as well as between the groups (the between-subjects factor), and differences between the variances of each individual participant’s data (Field, 2013; Laerd Statistics, 2015; Larson-Hall, 2010).

3.8.2 Analysis of the Survey Data

The second research question (RQ2), referring to the pupils’ views of using colour response cards, was addressed by the findings from the survey data analysis. Descriptive statistics were used to measure the mean scores for the pupils’ views of the four aspects of colour response cards: ‘1) The colour response cards helped me learn; 2) The colour response cards helped me to be quiet and listen to the teacher; 3) The colour response cards helped me to follow the teacher; and 4) The colour response cards helped me to cooperate with peers in the classroom.’ In addition, the reliability of the survey was determined using Cronbach’s alpha. The data and results were saved on the researcher’s computer and on two other devices: a password-protected laptop and an external hard disk for the sake of safety, while also ensuring easy access by the researcher.

3.8.3 Analysis of the Semi-structured Interviews and Journal Record Data

The next stage of the data collection consisted of interviews with the teachers, and their journal records of the intervention classes. The data gathered via these methods addressed RQ3 on teachers' perceptions of using colour response cards. Qualitative data involve searching for characteristic themes relating to the phenomenon under study. Thematic analysis was utilised in this study to analyse the data. As Braun and Clarke (2006) propose, it "should be seen as a foundational method for qualitative analysis" (p.78). These authors argue in favour of thematic analysis as a method in its own right: a "method for identifying, analysing, and reporting patterns [themes] within data" (p.79).

Systematic analysis helps researchers to make sense of data, arranging it to arrive at a carefully considered position, thereby justifying its interpretation to the academic community (Radnor, 2001, p.68). The process of thematic analysis renders the researcher's role more active in terms of thinking, searching, and creating codes and links between a personal understanding of the data, and the participants' experiences and realities. Consequently, this generates rich detail in response to the research questions (Radnor, 2001, p.80). In the present case, thematic analysis allowed the researcher to move back and forth throughout the qualitative data analysis phases, capturing ideas and writing notes (Radnor, 2001, p.86).

The thematic analysis approach has also been described as a method "used in connection with the analysis of qualitative data to refer to extraction of key themes in one's data. It is a rather diffuse approach with few generally agreed principles for defining core themes in data" (Bryman, 2008, p.700). The data to be analysed in the present study were collected from individual interviews with three teachers (involved in the intervention study), before commencing the transcription process. Each transcript was then translated from Arabic into English, whereupon the researcher subsequently highlighted and colour-coded rich statements (relevant to RQ3). For each of the interview questions, sub-categories, categories, and themes were set and coded, before being entered into a Microsoft Word table. A number of sub-categories and categories subsequently defined a set of codes, which were continually updated. Finally, the researcher analysed the interview data using a thematic and coding system, prior to converting the information into a Microsoft Word document.

The interviews and teachers' reflective activities were translated, so that the most interesting points could be isolated, together with the concepts being correlated with the various methods of data collection. The researcher checked the accuracy of the transcripts with the

teachers to ensure that their comments had been captured correctly. There were 26 codes identified, to which various statements were linked. For example, the following statement from one of the interviewees referred to the pupils' motivation:

Yes, I noticed that one girl who had a disability started to use the cards regularly, which means they gave her motivation to engage, and she is happy when she uses them and answers correctly.

Accordingly, this statement is linked to the code 'Motivation'. The list of codes was further combined to form 10 sub-themes, which were further grouped into three main themes, as shown in Table 3.3.

Table 3.3:*Coding of interview data*

Main Theme	Sub-theme	Codes
Positive elements of colour response cards on pupils	<ul style="list-style-type: none"> Increased attention Better performance Self-confidence More fun and enjoyment 	<ul style="list-style-type: none"> Attention Interest Skills Competencies Performance Pupils' confidence Motivation Fun Enjoyment Positive behaviour
Positive impact on teachers	<ul style="list-style-type: none"> Easier to manage the class Effective feedback from teachers Increased teacher confidence Adjusting instructions according to the pupils' need 	<ul style="list-style-type: none"> Easy to use Managing the classroom Assessment T:Interest Teaching strategies Quality Teachers' confidence Work burden Approaches Feedback
Future use of colour response cards	<ul style="list-style-type: none"> Sharing experiences with colleagues Benefits of using colour response cards in other subjects 	<ul style="list-style-type: none"> Adaptability Application in other subjects Benefits Decision-making Experiences Cost-effective

Table 3.4:*Definition of codes in light of competence, relatedness and autonomy components of SDT*

RELEVANCE TO SDT	CODES	DEFINITION
Competence	Skills	Pupils' ability to do something well
	Competencies	Pupils' ability to do something effectively and efficiently
	Performance	Act of doing something related to learning
Relatedness	T:Easy to use	Teachers' level of easiness in using colour response cards
	Managing the classroom	Teachers' ability or actions to manage the classroom
	Assessment	Teachers' actions about judging pupils' learning or engagement or behaviour
	Teaching strategies	The methods, techniques, procedures and processes that a teacher uses during instruction
Autonomy	Quality	Something that reflects good or bad learning or teaching process
	Teachers' confidence	The feeling that teachers are sure about their own abilities and opinions in teaching process
	Feedback	Teachers comments or explanation to a doubt or situation raised by pupils
	Adaptability	Teachers' adjustment to the changing circumstances in the classroom in the process of teaching
	Application in other subjects	Applicability of using colour response cards in other subjects
	Approaches	A way to deal with a problem or situation in classroom
	Decision-making	The process of making a choice or selecting a course of action in the teaching process
	Experiences	An event or scenario that is experienced by teachers while using colour response cards
	Attention	Pupils' active responses or activity towards teacher or learning activities
	P:Interest	Pupils' feeling of wanting to know or learn something
Others/n/a	T:Interest	Teachers' feeling of wanting to know or learn something
	Pupils' confidence	The feeling that pupils are sure about their own abilities and opinions in learning process
	Motivation	Pupils' desire to do something of their interest related to learning
	Fun	Pupils' pleasure in doing something
	Enjoyment	Pupils' feeling of happiness and satisfaction in doing something
	Positive behaviour	Pupils' behaviour that reflects a positive, safe and supportive learning culture.
	Cost-effective	colour response cards giving the best possible results in teaching /learning in comparison with the money spent
	Work burden	A responsibility or difficult task that causes a lot of work or worry in teaching process
	Benefits	Something that benefits learning or teaching process by using colour response cards

The approach taken to coding interview data for the purposes of the analysis was guided by SDT as the theoretical framework for the analysis. There was a primary focus on content relevant to the three pillars of the theory: autonomy, competence, and relatedness. Firstly, codes such as skills, competencies, performance are related to pupils' competencies which are observed by using colour response cards. These are manifested in example such as "the feeling that pupils are sure about their own abilities and opinions in learning process" and "pupils' ability to do something effectively and efficiently". Similarly, codes such as managing the classroom, assessment, teaching strategies, approaches, feedback, adaptability are linked to relatedness factor, as these codes reflect something that is the result of pupils and teachers' interaction or relationship. For instance, assessing pupils' using colour response cards reflects the interaction between the teacher and pupil, which had positive impact on the pupils' competencies as observed by Ryan (2000). Furthermore, codes such as attention, pupils' interest, pupils' confidence, motivation, fun, enjoyment, positive behaviour reflect their association with autonomy. For example, pupils' reflected confidence in taking decisions autonomously by changing their behaviour after using the colour response cards, indicating the impact of relatedness and competence on autonomy. Therefore, from the coding of interview data, it can be observed that this research is very much guided by self-determination theory, which is the main theoretical framework adopted in this study. However, some useful and relevant observations made by the teachers could not be transparently linked to SDT, but these were also coded and included in the analysis.

3.9. Validity and Reliability of the Study Design

3.9.1 Quantitative Research

Validity in quantitative research can be defined as adopting positivist standards and paradigms to obtain realistic data (Cohen et al., 2011). Such data can be gathered through what the above authors refer to as 'faithful premises' that can be relied on. These premises can take the form of trusted assumptions as well as statistical data (Cohen et al., 2011). In quantitative research, three types of validity have been distinguished: firstly, external validity, which refers to the ability to generalise and secure results with a random sampling technique for the relevant population (Creswell & Plano Clark, 2011). Second, construct validity refers to whether a hypothesised construct actually measures what it is intended to measure (Edmonds & Kennedy,

2017), and third, internal validity pertains to whether the results obtained are affected solely by changes in the independent variable being manipulated, as opposed to any other source that is external to the study (Devellis, 2016; Hair et al., 2010).

External validity was of high consideration for this study, because of the limited sample of just two schools, which might not have been representative of all primary schools. For example, the observational data collected by a teacher could have been influenced by her being exceptionally experienced and conscientious, or else the opposite. These issues could be followed up by further studies at different schools and by increasing the sample size. However, generalisability can be assessed from two perspectives. Firstly, the extent of the generalisability can be derived from the situation and context constructed by the researcher. Secondly, it can lie in the people who participated in the experiment being representative of people in general (Aronson et al., 2010). As explained in a description of the procedures (see Subsection 3.4.2.3), and materials and measures (see Subsection 3.4.2), for this study, authentic classroom settings and a real sample population (pupils displaying high levels of disruptive behaviour and low academic engagement) were used, drawing upon the actual classroom experiences of pupils and teachers to collect data in surveys and semi-structured interviews, respectively. Thus, external validity is supported by the two conditions mentioned above. Construct validity has been achieved, because the measures are based on well-defined categories of observable behaviours and not psychological constructs. Accordingly, the findings can be associated and generalised with self-determination theory (SDT), as it reflects the impact of colour response cards on motivating pupils to engage in learning, thereby reducing their disruptive behaviour.

Construct validity can help analyse the relationship between different variables (Creswell & Plano Clark, 2011; Oppenheim, 2009; Thomas, 2013) and also to give an understanding of the knowledge constructed in a mathematics classroom when colour response cards are used. In the present context, construct validity was applied to determine how colour response cards could impact upon pupils' behaviour (academic engagement, disruptive behaviour). The differences in pupils' behaviour while using colour response cards were measured at the pre-intervention, introduction, and established stages, in order to determine the construct validity.

The internal validity of experimental research can be assessed using confounding variables (Creswell & Plano Clark, 2011; Edmonds & Kennedy, 2017). Variables that can cause bias and increase variance are considered as confounding variables (Glen, 2017). For example, individual differences in pupil behaviour (disruptive behaviour, academic

engagement) would be considered confounding variables in this current study. Here, the risk of confounding variables affecting the results was minimised, in that the allocation of pupils, use of colour response cards, and length of time were all controlled.

Internal validity was considered in this quasi-experimental research in terms of potential confounding variables (Creswell & Plano Clark, 2011; Edmonds & Kennedy, 2017), which can introduce bias and increase variance (Stephanie, 2017). Confounding variables, such as ‘age’ could have affected the results and therefore, control variables were introduced (pupils aged 6-7 years were sampled for this study, without extending to a wider age group). In addition, within-subject design tests were conducted with the same subjects each time. The validity of a research study is concerned with whether the observed findings accurately reflect what the researcher believes he or she is measuring. For this study, a key assumption was that the pupils would be using the colour response cards in an honest fashion. For example, they would hold up a red card only because they did not know the answer and not because they could not be bothered to pay attention, were bored with the cards, trying to ‘mess the teacher around’, being awkward, or trying to slow down the lesson.

Social validity is an important factor to be determined for assessing participants’ views of an intervention in a study. Feedback from the participants can be evaluated to ascertain their perceptions of and attitudes towards an intervention. Various studies have used different methods for assessing social validity. For instance, studies involving the ‘good behaviour game’ as an intervention (Lynch & Keenan, 2018; Rubow et al., 2018), the response card intervention (Duchaine et al., 2018; Paulish, 2018), and the response card system (Aggarwal, 2018; Stowell & Nelson, 2007) have deployed questionnaires to assess the participants’ (pupils’ and teachers’) perceptions of the respective interventions. Similarly, for the present study, a survey questionnaire adopted from Menzies et al. (2017), based on a five-point Likert scale (Cohen et al., 2000), was utilised to evaluate pupils’ perceptions of using colour response cards. While it was encouraging that pupils’ feedback via colour response cards could indicate whether the cards had a positive or negative effect on pupils’ behaviour, it was also important to refine and analyse the data relating to the use of the cards, in order to address RQ2.

Reliability in quantitative research is described as obtaining the same results whenever identical tests or scales are applied to the same sample (Oppenheim, 2009; Thomas, 2013). According to Bowling (2014), reliability represents a form of stability for the same results,

where equivalent experiments or measures are carried out. For the current study, any value achieved would show identical results whenever it was duplicated.

It was important to check the reliability of the behavioural observations conducted in this study. The reliability of the data obtained from the structured observational checklist was assessed by examining the consistency of the observations between the researcher and two co-observers in nine interventions in a mathematics classroom, in order to calculate the inter-observer agreement during the introduction stage. Inter-observer agreement is a popular method for analysing the reliability of observational data (Mitchell, 1979; Watkins & Pacheco, 2000). Additionally, the researcher and co-observers observed the pupils' behaviour according to two categories (disruptive behaviour, academic engagement) in 30-minute periods during each lesson. A score of '1' was assigned to agreement in classifying the behaviour and '0' for non-agreement. The scores were added and divided by the total number, then expressed as a percentage to indicate the percentage agreement between the two observers. This involved calculating the percentage of agreement between them in terms of their joint observations of the three intervention classes. Inter-observer checks were conducted on 10% of the observed colour response card sessions across times 1, 2 and 3 for the three classes, revealing agreements ranging between 0.78 and 1.0 (see Table 3.5). The results indicate that the researcher's observations were reliable.

Table 3.5:

Agreements between observers

Sessions	1	2	3	4	5	6	7	8	9
Agreement level	78%	78%	89%	89%	78%	78%	89%	100%	100%

In addition, a Pearson's correlation value of 0.91 was calculated from the two observations, thus revealing a strong positive association between the observer and co-observer ratings. In order to assess the level of internal consistency within the survey, Cronbach's alpha (Cronbach, 1951) was applied. This method suggests that a questionnaire is sufficiently reliable, if the Cronbach's alpha value is not below 0.70. When this was performed in the current study, the reliability coefficient was found to be reliable and ready to be administered, as presented in Table 3.6.

Table 3.6:

Reliability statistics for the questionnaire

Cronbach's Alpha	Number of items
.77	5

3.9.2 Qualitative Research

Validity in the context of qualitative research concerns whether the findings truly represent the phenomenon that the researcher intends to measure, thereby justifying an interpretive approach (Creswell & Plano Clark, 2011). The validity of the qualitative methods used in this current research would depend on how accurately the teachers interpreted their experiences and expressed them independently. Whilst it is difficult to measure validity in some complex studies, there are three available strategies that can increase validity in qualitative research: triangulation, dependability, and credibility (Creswell, 2009; Creswell & Plano Clark, 2011; Flick, 2014). The triangulation approach involves using two or more methods in combination, for example, in the current study, the data from journal records and semi-structured interviews were used together. If both methods revealed the same findings, this would increase the study's validity. This approach was used to strike a balance between the strengths and weaknesses of the methods adopted.

Finally, dependability and credibility are ascertained by critically examining the research process (Creswell, 2009). Dependability relies on the characteristics of the logical, traceable, and documentable qualities of an investigation (Schwandt, 2015). Credibility is concerned with the consistency of the researcher's interpretation of the participants' statements, and what the participants have actually expressed in the inquiry (Given, 2008). The above author presented three strategies for maximising dependability and credibility: the first was by improving coherence throughout an investigation (collection, analysis, interpretation of the data), the second was by constructing an understanding of the findings by checking and analysing them (for example, using a different tool to enhance pupils' future classroom engagement), and thirdly, carrying out a detailed examination of all the procedures and related issues concerning the research process was recommended. For the present study, credibility was sought by establishing a good rapport with the interviewees and reassuring them that their comments would be kept anonymous and confidential.

In qualitative research, some argue that reliability is an essential factor, as multiple realities are likely to emerge in interpretative studies (Thomas, 2013). However, Thomas (2013) maintains that reliability is “irrelevant in interpretative research” (p.39), due to the liability of perceptions to change when they are repeated in such (interpretative) research. While Thomas is correct to an extent on this point, it is also possible that perceptions will not change in the long term, if there are no external factors to propagate changes in opinions or perceptions. In the context of a research study, reliability is concerned with the repeatability and consequently, the dependability of the findings. In order to address such reliability issues, efforts were made in this study to ensure that the same procedures were used during all the observations of pupils, interviews and journal recording by the teachers as well as feedback survey conducted among the pupils. To check the reliability of the coding of qualitative data, the researcher sought help from peers who had experience of coding interview data. Assessing the reliability of the development of coding system categories and sub-categories is a prerequisite, as “the code development process is typically better when it is done with others” (Boyatzis, 1998, p.11). The researcher was able to provide details of the data collection and the creation of the coding system, as well as explaining the procedure applied in the data analysis, so that other researchers could follow it.

3.10 Ethical Considerations

Ethics in research are concerned with assessing how humans are treated in a research study. For example, the researcher may ask the question, ‘Are the participants at risk of being harmed in any way?’ (Coe et al., 2017). In the present study, these considerations included showing respect for the information obtained from the participants, being honest about the nature of the study with both the pupils and their parents, and ensuring that no harm came to either the researcher or the participants (Cohen et al., 2011; Robson & McCartan, 2016). Specifically, in quasi-experimental research, one of the focal principles is to protect the participants and ‘do no harm’, whatever the experimental manipulation. To minimise the possibility that any harm came to the pupils the researcher ensured she got to know the pupils in the classes she was observing, that the teacher introduced the researcher every time she visited and that pupils were given the opportunity to ask the researcher questions about what she was doing and why. Further she explained how the pupils were being helpful in taking part in the study and this was very much appreciated. When introducing the survey, the respective teachers went through the process and the consent form reassuring the pupils that this was not something they had to

do and was not part of any assessment. It was therefore hoped, through these actions, that a safe environment for the pupils had been created, where there was no anxiety created and hence, no harm was identified that could occur to the pupils as a result of their using, or not using, the response cards or taking part in the study (Robson & McCartan, 2016).

Whilst the intervention proved to be effective, the lack of time available in the selected primary schools and the lack of permission from the Ministry of Education meant the researcher could not carry out any further interactions with the pupils, nor could they offer the intervention to the control groups. However, the researcher will be producing a briefing paper for the schools involved which detail the approach and results of the study. Further, the Ministry of Education and the schools have given permission to the researcher to go into the schools to tell the whole staff group about the study's findings, and give training on the use of the CRCs, so that all pupils ultimately benefit.

Permission to conduct the interviews and survey was obtained from the Ethics Committee of the University of Reading's Institute of Education, and the Ministry of Education in Saudi Arabia (see Appendix I). In addition, the pupils' parents, teachers, and the pupils themselves were informed of the purpose of the study and how it could promote learning. Informed consent was obtained through consent forms, signed by the pupils, their parents, the teachers, and head teachers (see Appendix J). In addition, an appropriate information sheet was provided for the pupils (see Appendix K), explaining the research purpose and the participants' role in the study, along with the potential benefits of colour response cards.

Ethics in research should be an integral part of the research planning and implementation. It is the researcher's responsibility to ensure that the research does not negatively impact on the subjects, which includes considerations of privacy and anonymity (Keller & Lee, 2003). This commitment to care was made alongside adherence to stringent ethical guidelines. Despite this research being conducted in Saudi Arabia, the UK code of ethical practice was still applied, as specified in the British Educational Research Association (BERA) guidelines. As per these guidelines, consent from the participants (pupils, parents, teachers) was obtained prior to the study (see Appendices J3-K). In addition, transparency in the data collection, privacy, and the data security of the participants was ensured.

Firstly, two schools were sought, where the staff and pupils were willing to participate. The researcher would like to emphasise here that the teachers and pupils involved in this study

were shown trust and respect. Since this research involved investigating a topic with vulnerable subjects, it was necessary to observe a high level of data confidentiality at all times. Furthermore, consent forms are a critical component of research ethics, and in this study, five different consent forms were required: one each for the administrators, head teachers, teachers, parents, and pupils. In addition, the information sheet and consent forms were drafted and translated into Arabic, before being distributed to each participant. These forms included written guarantees of confidentiality and anonymity. Furthermore, an essential part of the interview protocol was to obtain the participants' consent to be audio-recorded during the interviews.

It was also emphasised that the researcher and her research supervisors would be the only people to have access to the data gathered and recorded during the experiments, observations, questionnaire survey, interviews, and from the journal records. Moreover, assurance was provided that the data would be deleted once the research had been completed. The participants were also informed that they had the right to withdraw from the study at any stage. Finally, as the entire research process was conducted in a school environment, the ethical aspect of the research design required the performance of several procedures (see Subsections 3.10.1, 3.10.2, and 3.10.3).

The way in which the pupils might have perceived the use of colour response cards is an area of concern, which includes the possible impact of these cards on their mental state and development. For example, it was considered that the pupils might find using the cards to be silly rather than a fun activity. Therefore, the pupils were made aware of using these cards interactively, given time to familiarise themselves with their use, and informed of the benefits of that usage. Finally, any doubts or issues raised by the pupils were addressed during these interactive sessions.

3.10.1 Gaining Access to Schools

As mentioned previously, for the researcher to be able to access public-sector primary schools in Saudi Arabia, permission had to be sought from the Ministry of Education, school districts, and pupils' parents (Cohen et al., 2007). Accordingly, the researcher submitted a letter to the Saudi Embassy's Cultural Bureau in London, providing details of the research title, aims, methods as well as the anticipated benefits for schools, teachers and pupils, along with her stated commitment to preserving the participants' anonymity and keeping the collected data

confidential. This meant refraining from disclosing the names of the targeted schools and the districts in which they were located in Jeddah. The letter in question was sent from London, in accordance with official procedures, to Saudi Arabia's Civil Service Commission, the Saudi Ministry of Education, the school districts, two state-sector schools, and the pupils' parents.

3.10.2 Confidentiality

The participating teachers were assured of the voluntary nature of their participation in this study, with the colour response card intervention being implemented over three months of the school's academic year, 2018-2019. The teachers had the right to review the interview drafts, which were transcribed from the audio-recorded sessions, and to make comments or suggest any changes. Moreover, their official approval to present the anonymised data in publications or at conferences was obtained. They were also informed that the data would be kept locked in the researcher's home office in computer files, stored on a password-protected device. It was clarified to them that once use of these data had been exhausted; they would be deleted.

3.10.3 Training and Interactive Sessions

Prior to the intervention study, training was provided to the participating teachers in how to use the colour response cards effectively in the classroom. In addition, interactive sessions were conducted with the pupils' parents in the presence of their class teachers, in order to clear up any doubts and address any issues over the pupils' participation in the study. The parents were assured that no harm would come to their pupils while participating in the intervention study. In addition, three interactive sessions were held with pupils in each intervention class, whereupon they were trained in using the colour response cards in a fun and interactive way. They were also informed of the potential benefits of the intervention, and how it could help them actively engage in learning.

3.11 Chapter Summary

This chapter has provided a detailed account of the methodology adopted for this study. The philosophical assumptions and research paradigm underpinning the research have correspondingly been explained, namely, pragmatism. An explanatory mixed methods design was employed, involving both quantitative (quasi-experimental structured observations and survey) and qualitative approaches (semi-structured interviews and journal records). The

structured observations were used to record the academic engagement and disruptive behaviour of selected pupils, in order to address RQ1, whereas the survey questionnaires assessed the pupils' perceptions of using colour response cards, thereby addressing RQ2. In addition, semi-structured interviews were conducted, and journal records kept to analyse the teachers' perceptions of using colour response cards in the classroom, and how such usage affected their assessment practices and classroom management, consequently addressing RQ3. Therefore, overall, all RQs taken together allowed for an evaluation of the effectiveness of the cards and to shed light on why they worked as they did. Each method was presented in terms of the data collection and analysis, along with the pilot study and sampling strategy. The issues of reliability, validity, and ethical considerations were likewise discussed, producing findings that are presented in detail in the next chapter.

CHAPTER FOUR: FINDINGS

4.1 Introduction

As discussed in the previous chapter, the implementation of the main research study lasted for three months. Quantitative data were collected from two main groups (intervention and control) at three time points (pre-intervention, introduction, established conditions), while the qualitative data were only collected from the intervention classes at the introduction time point and at the end of the intervention. Firstly, the process of evaluating and establishing whether the data met the necessary assumptions for parametric statistical tests is discussed in this chapter (see Section 4.2). Secondly, the quantitative observational data measuring the pupils' disruptive behaviour and academic engagement are analysed using ANOVA, with the results being presented in Subsection 4.2.2. Thirdly, the quantitative survey data relating to pupils' perceptions of using colour response cards are analysed descriptively (see Subsection 4.2.4). Fourthly, the qualitative data collected from three selected teachers in the intervention classes are analysed, these teachers having completed journal records during the introduction and established conditions stages, and having been interviewed by the researcher through semi-structured interviews (see Subsection 4.2.6). Finally, the main research findings are summarised in Section 4.3.

4.2 The Statistical Analysis and Its Assumptions

After collecting all the observational data on the levels of disruptive behaviour and academic engagement exhibited by the pupils, the data were entered into SPSS (Version 25) for descriptive statistical analysis and further inferential statistical analyses using ANOVA. The disruptive behaviour and academic engagement data were subjected to ANOVA for the factors, Group (intervention, control) by Time (pre-intervention, introduction, established). Time was a within-participants factor (pre-intervention, introduction, established) and Group was a between-participants one (intervention, control groups) in each analysis. These analyses were carried out to test the following hypotheses:

(H₁): The use of response cards has an impact on pupils' academic engagement in the classroom.

H_0 : The use of response cards has no impact on pupils' academic engagement in the classroom.

H_2 : The use of response cards has an impact on pupils' disruptive behaviour in the classroom.

H_0 : The use of response cards has no impact on pupils' disruptive behaviour in the classroom.

However, before testing these hypotheses, it was necessary to explore the distribution of variables to see whether or not parametric testing could be used, as explained below.

4.2.1 Testing Normality for the Experiment

It is necessary to explore the distribution of quantitative data before selecting the tests for data analysis (Field, 2018). Distribution hypotheses or assumptions, such as normality, homoscedasticity, and linearity, can be applied to identify whether or not parametric tests can be used (Field, 2018; Pallant, 2016). It is argued that parametric tests can be effective even when the assumptions are violated (Larson-Hall, 2015), but such an approach can lead to Type 1 (false positive) and Type 2 errors (inability to find a relationship between the variables, even though one exists).

A non-parametric test can be used in cases where distribution assumptions are violated. These tests are considered to be more flexible than parametric tests, because they are not affected by outliers and rely on the median rather than the mean (Field, 2018). From the perspective of this current study, normality can be understood as the normal distribution of scores on the dependent variable across the groups (intervention, control). Both graphical and statistical methods can be used to assess normality. Statistical tests include tests such as the Shapiro-Wilk, skewness, and kurtosis tests.

4.2.1.1 Shapiro-Wilk Test

As shown in Table 4.1, the Shapiro-Wilk test was used to test for normality. If the result of this test is a p -value greater than .05, it indicates that the data are normally distributed. However, if the result is less than .05, the data differ significantly from normal distribution (Field, 2018). While the Kolmogorov-Smirnov normality test is usually used for large sample sizes, the Shapiro-Wilk test was used in this study, as the sample size of 27 was considered small. The Shapiro-Wilk test is one of three general tests for normality, and it detects all deviations from normality.

Table 4.1 shows that the disruptive behaviour data were normally distributed in both groups and across three phases of the study. Meanwhile, Table 4.2 indicates that there were some deviations from normality in the academic engagement scores. In the introduction phase, the control group data were significantly abnormal, and in the established conditions phase, the intervention group data were also significantly so.

Table 4.1:

Shapiro-Wilk for normality on the variable of pupils' disruptive behaviour scores

Times	Group	Shapiro-Wilk		
		Statistic	Df	Sig.
Pre-intervention	Intervention	.966	27	.492
	Control	.972	18	.828
Introduction	Intervention	.977	27	.782
	Control	.930	18	.198
Established conditions	Intervention	.930	27	.069
	Control	.926	18	.165

Table 4.2:

Shapiro-Wilk for normality on the variable, pupils' academic engagement scores

Times		Shapiro-Wilk		
		Statistic	Df	Sig.
Pre-intervention	Intervention	.962	27	.418
	Control	.919	18	.126
Introduction	Intervention	.964	27	.460
	Control	.860	18	.012
Established conditions	Intervention	.662	27	.000
	Control	.937	18	.256

4.2.1.2 Skewness and Kurtosis Tests

Both skewness and kurtosis values should be either zero or nearly zero (between .05 and 1) to indicate an approximately normal distribution (Field, 2018). A positive skewness score reveals that the right tail of the distribution is longer than the left, whereas a negative one suggests that the distribution builds high. In addition, a positive kurtosis score shows that the tail of distribution is heavy, while a negative one reveals that the tail of distribution is light (Field, 2018). In this study, most of the scores were towards the bottom of the distribution, thus suggesting a possible floor effect.

There are no clear rules for determining the acceptable range based on the raw statistic for skewness/kurtosis itself. Skewness and kurtosis values of between -2 and +2 are considered acceptable to prove normal univariate distribution (George & Mallery, 2010). The z -statistic is derived by dividing skewness/kurtosis by the standard error. In this study, the z -statistic skewness/kurtosis scores for disruptive behaviour, as shown in Table 4.3, all fall within the $+-1.96$ range, except for the z -statistic for kurtosis in the intervention group (pre-intervention). This demonstrates that the distribution is not significantly different from normal distribution. Meanwhile, the z -statistic skewness/kurtosis scores for academic engagement, as shown in Table 4.4, all fall within the $+-1.96$ range, except for the z -statistic for kurtosis in the intervention group (established conditions), and z -statistic for skewness in the control group (introduction). This demonstrates that in most cases, the distribution did not differ significantly from normal distribution. However, it is an issue that needs to be addressed in the collected data.

The researcher performed skewness and kurtosis tests to ascertain whether the assumptions underlying the use of ANOVA were met. As analysis of variance is known to be relatively robust to violations of assumptions, such as those identified in the observational data, the researcher decided to use it, because ANOVA offers the benefit of allowing an investigation of both the main effects and interaction between two factors (Time, Groups). However, because the assumptions underlying the use of parametric tests were not fully met, non-parametric tests were also carried out to verify the findings. These analyses (see Appendices E, F and G) produced findings that are consistent with ANOVA.

Table 4.3:*Skewness and kurtosis normality tests for disruptive behaviour*

Stage	Group	Statistic	Statistic	Std. Error	Z-statistic
Pre- intervention	Intervention	Skewness	-.368	.448	-.821
		Kurtosis	-.176	.872	-.201
	Control	Skewness	-.293	.536	-.546
		Kurtosis	-.681	1.038	-.656
Introduction	Intervention	Skewness	.087	.448	0.194
		Kurtosis	-.547	.872	-0.627
	Control	Skewness	-.369	.536	-0.688
		Kurtosis	-.1.027	1.038	-0.099
Established	Intervention	Skewness	.0893	.448	0.199
		Kurtosis	-1.368	.872	-1.569
	Control	Skewness	.490	.536	0.914
		Kurtosis	-.812	1.038	-0.782

Table 4.4:*Skewness and kurtosis normality tests for academic engagement*

Stage	Group	Statistic	Statistic	Std. Error	Z-Statistic
Pre-intervention	Intervention	Skewness	.402	.448	0.897
		Kurtosis	-.286	.872	-0.328
	Control	Skewness	-.336	.536	-0.627
		Kurtosis	-1.294	1.038	-1.247
Introduction	Intervention	Skewness	-.035	.448	-0.078
		Kurtosis	-.747	.872	-0.857
	Control	Skewness	1.226	.536	2.287
		Kurtosis	.818	1.038	0.788
Established conditions	Intervention	Skewness	-.3205	.448	-0.715
		Kurtosis	13.375	.872	15.338
	Control	Skewness	.563	.536	1.05
		Kurtosis	-.643	1.038	-0.619

4.2.1.3 Linearity

A scenario where there is a linear relationship between two variables is usually referred to as linearity (Pallant, 2016). That is, this means that the predictor variables in the regression have a linear relationship with the outcome variable (Field, 2018). A linear regression test was conducted in this study using SPSS to check for linearity, in order to understand the relationship between the error in the experiment and its predicted results. A P-P plot compares the distribution of residuals with normal distribution; a solid line in a P-P scatterplot represents the theoretical quantiles of normal distribution, and if the points form a straight line, normality is indicated. The findings (see Appendix H) reveal that all the graph points were linear in this study and no curves were identified.

4.2.1.4 Homoscedasticity

Homogeneity of variances is referred to as homoscedasticity (Field, 2018). Levine's test was conducted to verify this assumption, which considers that “the variances for different groups are equal and valid (Levene's test null hypothesis)” (Field, 2018, p.257). Levene's test can be performed using one-way ANOVA (see Tables 4.5, 4.6). As presented in Table 4.5, the results of Levene's test for the disruptive behaviour scores in the pre-intervention, introduction, and established conditions stages were all significant, thus indicating that variance in either group (intervention, control) for each test cannot be assumed as being equal.

Table 4.5:

Test of homogeneity of variances for the disruptive behaviour data

Times		Levene's Statistic	df1	df2	Sig.
Pre-intervention	Based on mean	5.665	4	40	.001
	Based on median	4.618	4	40	.004
	Based on median and with adjusted df	4.618	4	29.988	.005
Introduction	Based on trimmed mean	5.664	4	40	.001
	Based on mean	7.183	4	40	.000
	Based on median	4.458	4	40	.004
Established conditions	Based on median and with adjusted df	4.458	4	21.463	.009
	Based on trimmed mean	6.961	4	40	.000
	Based on mean	11.756	4	40	.000
	Based on median	5.722	4	40	.001
	Based on median and with adjusted df	5.722	4	23.617	.002
	Based on trimmed mean	11.801	4	40	.000

As presented in Table 4.6, illustrating academic engagement under the pre-intervention, introduction, and established conditions, it can be observed that the *p*-value is less than 0.05, leading to the null hypothesis of Levene's test being rejected. This indicates that variance in either group (intervention, control) for each test cannot be assumed as being equal, which was taken into account in the analyses.

Table 4.6:*Test for homogeneity of variances for academic engagement data*

Times		Levene's Statistic	df1	df2	Sig.
Pre-intervention	Based on mean	23.191	1	43	.000
	Based on median	21.043	1	43	.000
	Based on median and with adjusted df	21.043	1	32.182	.000
	Based on trimmed mean	23.092	1	43	.000
Introduction	Based on mean	15.292	1	43	.000
	Based on median	7.159	1	43	.011
	Based on median and with adjusted df	7.159	1	20.291	.014
	Based on trimmed mean	13.261	1	43	.001
Established conditions	Based on mean	4.624	1	43	.037
	Based on median	3.522	1	43	.067
	Based on median and with adjusted df	3.522	1	43.000	.067
	Based on trimmed mean	4.342	1	43	.043

4.2.2 Results of Evaluating the Impact of Using Colour Response Cards on Pupils' Behaviour (Disruptive Behaviour)

4.2.2.1 Results of Evaluating the Impact of Using Colour Response Cards on Pupils' Behaviour (Disruptive Behaviour) across Groups in the Classroom

In order to investigate the impact of using colour response cards on pupils' disruptive behaviour (RQ1), the quantitative observational data were analysed. Two-way mixed ANOVA was carried out to investigate whether there was: a) a significant main effect of either factor (Time, Group), or b) a significant two-way interaction between the two independent variables (Time, Group) on the dependent variable. By implementing this procedure, the differences in pupils' behaviour were examined between different groups and at different test time points.

Table 4.7 presents the descriptive statistics for each group (intervention, control) across three time periods (pre-intervention, introduction, established conditions). The means (average scores for observations in one session) suggest that disruptive behaviour decreased during the introduction and established conditions stages in the intervention group, whereas in the control

group, this behaviour was only slightly increased. In contrast, the control group displayed higher levels of disruptive behaviour, compared to the intervention group prior to the intervention. Thus, these two main groups were not very well matched. However, the disruptive behaviour in the control group increased over time, whereas that in the intervention group was reduced. In order to investigate whether these effects were significant, mixed two-way ANOVA analysis was implemented.

Table 4.7:

Descriptive statistics for pupils' behaviour (disruptive behaviour) across the pre-intervention, introduction and established conditions stages in the intervention and control groups

Groups (N)	Pre-intervention		Introduction		Established Conditions	
	Mean	SD	Mean	SD	Mean	SD
Intervention group (27)	.300	.092	.197	.068	.177	.066
Control group (18)	.487	.169	.551	.192	.577	.230

In order to examine the effect of Time (pre-intervention, introduction, established conditions) and Group (intervention, control), and the interaction between the two, a two-way Group by Time mixed ANOVA was carried out on the disruptive behaviour scores.

Mauchly's sphericity test was then used to validate a repeated measures analysis of variance for the disruptive behaviour measure. As identified from Table 4.8, the probability of Mauchly's test statistic is less than .05 ($p<.05$), reflecting significant differences between the variances. Consequently, sphericity cannot be assumed, that is, there was a lack of sphericity in variance between the groups within subjects (Time). If the assumption of sphericity is not met, the degrees of freedom will be overestimated, and the F -value inflated.

Table 4.8:

Result of two-way, Group by Time ANOVA of the disruptive behaviour scores

Source		Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Time	Sphericity Assumed	.010	2	.005	.678	.510	.016
Groups		3.189	1	3.189	96.634	.000	.692
Time	x Sphericity Assumed	.269	2	.134	18.112	.000	.296
Group							

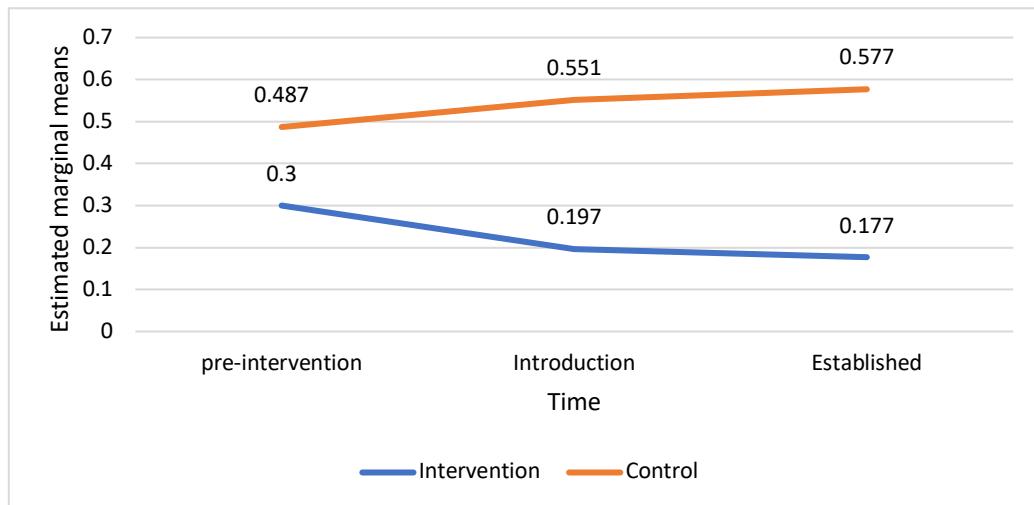
According to Table 4.8, there was no statistically significant main effect of Time identified in the analysis. However, a statistically significant main effect of Group was identified as well as a significant interaction between Time and Group.

4.2.2.2 Time and Group Interaction

The Time by Group interaction in relation to disruptive behaviour is illustrated in the graph presented in Figure 4.1. The disruptive behaviour scores rose over time in the control group but decreased in the intervention group. The intervention group consistently generated a lower estimated marginal mean disruptive behaviour score than the control group. The effect size for the interaction was moderate at .296, while that for Group was large (.692), following Cohen's (1988) cut-off values. In relation to disruptive behaviour, the control group had a higher estimated marginal mean than the intervention group.

Figure 4.1:

Graphical representation of the interaction between Time and Group in relation to the disruptive behaviour scores



To investigate the simple effects of both Group and Time on disruptive behaviour, a series of one-way ANOVAs (between- and within-participants) was carried out, as reported in Table 4.9 below. The simple effect of Group emerged as being significant at the pre-intervention, introduction, and established conditions time points. At all-time points, the control group exhibited more disruptive behaviour than the intervention group.

Table 4.9:

Results of one-way ANOVAs to investigate the simple effect of the groups' disruptive behaviour at each time point (pre-intervention, introduction, established conditions)

Times		Sum of Squares	df	Mean Square	F	Sig.
Pre-intervention	Between groups	.399	4	.100	5.789	.001
	Within groups	.689	40	.017		
	Total	1.088	44			
Introduction	Between groups	1.357	4	.339	18.392	.000
	Within groups	.738	40	.018		
	Total	2.095	44			
Established conditions	Between groups	1.838	4	.459	37.267	.000
	Within groups	.493	40	.012		
	Total	2.331	44			

4.2.2.3 Pair-wise Comparisons

Post-hoc comparisons were carried out to investigate further the nature of the interactions by looking at the simple effect of Time for: a) the intervention group; and b) the control group. Bonferroni correction was applied to Type 1 errors, calculated by dividing the alpha level by the number of pairwise tests. Post-hoc comparisons of the disruptive behaviour scores are shown in Table 4.10. The results indicate that in the intervention group, there was a statistically significant difference between the pre-intervention and introduction stage as well as between the pre-intervention and established conditions stage, but not between the introduction and established conditions stage. This indicates that there was a positive effect of the colour response cards at the introduction stage, and this was maintained until the established stage.

Table 4.10:

Pairwise comparisons for disruptive behaviour in both the intervention and control groups at three time points

Group	(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
						Lower Bound	Upper Bound
Intervention	Pre-intervention	Introduction	.103*	.024	.000	.042	.163
		Established conditions	.123*	.022	.000	.069	.177
	Introduction	Established conditions	.021	.024	1.000	-.039	.081
	Control	Pre-intervention	-.063	.030	.126	-.137	.012
		Established conditions	-.089*	.027	.005	-.155	-.023
		Introduction	-.026	.030	1.000	-.100	.047

In reference to the control groups, no significant effect of Time between the pre-intervention and introduction stages ($p=.126$) or between the introduction and established conditions stages ($p=1.000$) was identified. However, there was a significant difference between the pre-intervention and established conditions time points in the control group. In fact, the significant difference for the control group in both cases was a decline. Thus, using the colour response

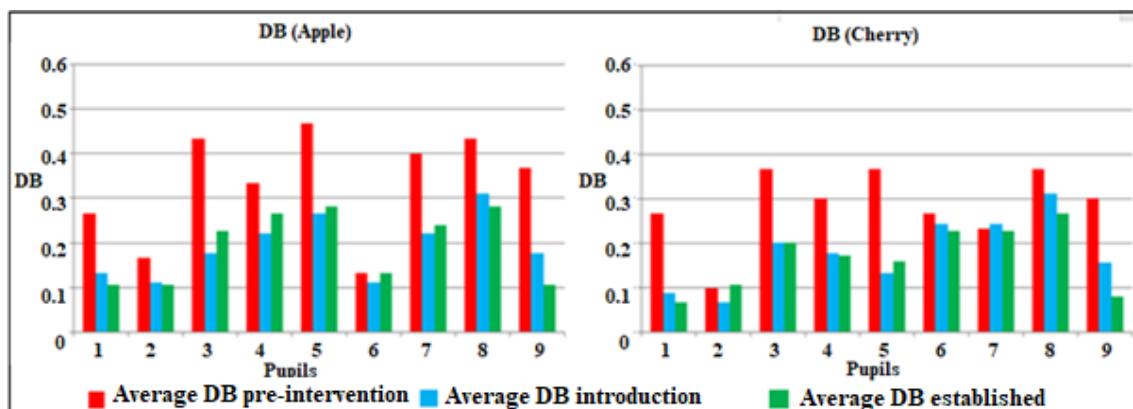
cards as an intervention can be considered effective, because it helped to reduce disruptive behaviour in the intervention classes, in comparison to the control classes.

4.2.2.4 Effects of Colour Response Cards on Individual Pupils' Disruptive Behaviour in the Intervention Group

The previous analysis examined group differences, but the averaging of data can obscure the presence of individual differences, especially where group sizes are relatively small. This subsection, therefore, examines individual pupil profiles at each of the three time points (pre-intervention, introduction, established conditions), with respect to disruptive behaviour.

Figure 4.2:

Overview of the average disruptive behaviour scores in the pre-intervention, introduction, and established conditions observations at School A for each pupil in the Apple and Cherry Groups



The bar charts (see Figure 4.2) for the Apple and Cherry Groups (classes) reveal variation between pupils in their pre-observation levels of disruptive behaviour. While all but one of their individual profiles exhibit a fall in disruptive behaviour following the introduction of colour response cards, this was, in the main, most marked among those with the highest rates of disruptive behaviour in the Apple (3, 5, 7, 8, 9) and Cherry (3, 5, 8) Groups. However, this was not always the case, for example, Pupil 9 in the Cherry Group displayed greater decline than Pupil 8, despite initial lower levels of disruptive behaviour.

Whilst there was a substantial decrease in disruptive behaviour among pupils in both the Apple and Cherry Groups 'after the intervention', there was a slight increase in the pupils' disruptive behaviour 'during the intervention' (Pupils 3, 4, 5, 6, 7 in the Apple Group; Pupils 2, 5 in the Cherry Group). For example, substantial change was observed with respect to Pupil 5 (Apple Group), who exhibited high levels of disruptive behaviour before the intervention in

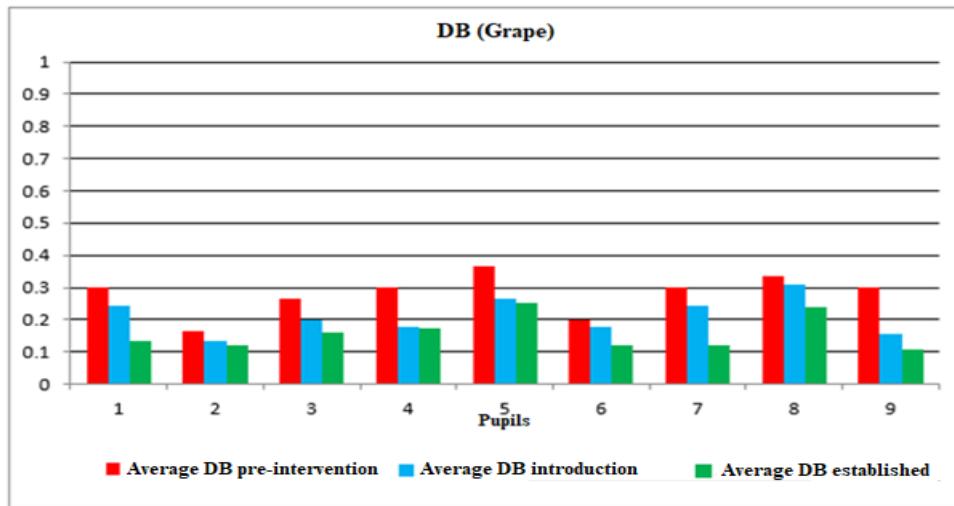
terms of talking to peers, playing while the lesson was taking place, and shouting in class. However, during the intervention, her attention was diverted towards the colour response cards, which she was keen to use in class. Accordingly, a shift in her behaviour was observed towards learning and being attentive to the teacher during lessons, whereupon she was ready to use the cards whenever the teacher asked a question.

In the established conditions stage, Pupil 5 continued to use the colour response cards and was actively engaged in learning, indicating a shift in her focus from using the cards towards learning mathematics. Thus, it was evident that the colour response cards had been effective in increasing her focus on learning and reducing her disruptive behaviour. However, Pupil 3 (in the Apple Group) exhibited similar disruptive behaviour during the intervention stage, whilst there was a slight increase in the established conditions stage. However, the fact of her being marked out with a badge for observation, and her earlier behaviour of talking to peers, may have been the result of her peers talking to her. Thus, it was acknowledged that Pupil 3's slight increase in disruptive behaviour could be attributed to the involvement of peers in distracting her.

The results suggest that while using colour response cards, disruptive behaviour was pointedly reduced. Moreover, after completing the intervention and when the pupils stopped using the cards, disruptive behaviour was observed to increase, as identified by the teacher (in an informal follow-up discussion). Therefore, it was the continuous use of colour response cards that appeared to be effective in controlling disruptive behaviour in the classroom. Conversely, pupils with initially low rates of disruptive behaviour in the Apple Group (for example, Pupils 2 and 6) and in the Cherry Group (Pupil 2) showed relatively little change. The single exception was Pupil 7 in the Cherry Group, whose disruptive behaviour increased slightly during the introduction stage.

Figure 4.3:

Overview of the average disruptive behaviour (DB) scores in the pre-intervention, introduction, and established conditions observations at School B for each pupil in the Grape Group



However, the average level of disruptive behaviour in the Grape Group at School B decreased across all the pupils from pre-intervention to introduction, and from then, to the established conditions stage, revealing a similar effect of the intervention on all pupils in the Grape Group (see Figure 4.3).

4.2.3 Result of Evaluating the Impact of Using Colour Response Cards on Pupils' Academic Engagement

4.2.3.1 Result of Evaluating the Impact of Using Colour Response Cards on Pupils' Academic Engagement between Groups in the Classroom

In order to investigate the impact of using colour response cards on pupils' academic engagement (RQ1), the quantitative observational data were analysed. Table 4.11 presents the descriptive statistics (for academic engagement) for each group (intervention, control) at three time points (pre-intervention, introduction, established conditions). The means suggest that academic engagement slightly increased in the intervention group, while it decreased in the control one. In order to ascertain whether these effects were significant, a mixed two-way Group by Time ANOVA was carried out on the academic engagement data.

Table 4. 11:

Descriptive statistics for pupils' behaviour (academic engagement) from the pre-intervention, introduction and established conditions stages in the intervention and control groups

Groups (N)	Pre-intervention		Introduction		Established	
	Mean	SD	Mean	SD	Mean	SD
Intervention group (27)	.696	.094	.805	.068	.793	.140
Control group (18)	.612	.215	.412	.197	.452	.232

As the assumption of sphericity was violated, when the two-way ANOVA was carried out a Greenhouse-Geisser correction was applied. Analysis revealed a statistically significant main effect of Group, but not of Time. There was also a significant interaction between Group and Time, as shown in Table 4.12.

Table 4.12:

Result of two-way, Group by Time ANOVA of the academic engagement scores

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Square d
Time	Greenhouse-Geisser	.047	1.723	.027	1.380	.257	.031
Group	Greenhouse-Geisser	2.416	1	2.416	72.547	.000	.628
Time		.588	1.723	.341	17.234	.000	.286
*Group							

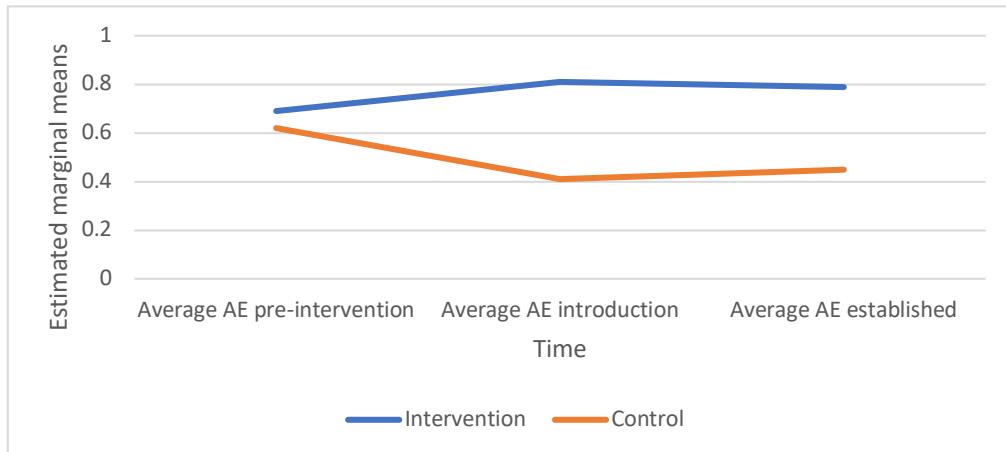
4.2.3.2 Time and Group Interaction

Similarly, Figure 4.4 shows the interaction between Time and Group in relation to academic engagement. The intervention group, where colour response cards were used, consistently delivered a higher estimated marginal mean academic engagement score than the control group. The estimated marginal means reflected the simple effect of Group and Time. The effect size for the interaction was moderate at .286, while the effect size for Group was large (.628).

The intervention group displayed a higher overall level of academic engagement than the control group in the classroom.

Figure 4.4:

Graphical representation of the interaction between Time and Group in relation to academic engagement scores



As shown in Table 4.13, the simple effect of Group was identified as significant at the pre-intervention, introduction, and established conditions time points. Moreover, at all three time points, the intervention group displayed more academic engagement than the control group.

Table 4.13:

Results of one-way ANOVAs to investigate the simple effect of the groups' academic engagement at each time point (pre-intervention, introduction, established conditions)

Times		Sum of Squares	df	Mean Square	F	Sig.
Pre-intervention	Between groups	.241	4	.060	2.847	.036
	Within groups	.848	40	.021		
	Total	1.090	44			
Introduction	Between groups	1.692	4	.423	22.428	.000
	Within groups	.754	40	.019		
	Total	2.447	44			
Established conditions	Between groups	1.339	4	.335	13.032	.000
	Within groups	1.027	40	.026		
	Total	2.366	44			

4.2.3.3 Pair-wise Comparisons

Post-hoc comparisons were carried out to investigate the nature of the interaction further, by looking at the simple effect of Time for: a) the intervention group; and b) the control group. Bonferroni correction was applied to Type 1 errors, calculated by dividing the alpha level by the number of pairwise tests. Post-hoc comparisons for academic engagement scores are shown in Table 4.14.

Table 4.14:

Pairwise comparisons for academic engagement in both the intervention and control groups at three time points

Group	(I) Time	(J) Time	Mean Difference (I-J)	95% Confidence Interval for Difference ^b			Lower Bound	Upper Bound
				Std. Error	Sig. ^b			
Intervention	Pre-intervention	Introduction	-.109*	.039	.022	-.204	-.013	
		Established conditions	-.096	.039	.056	-.194	.002	
	Introduction	Established conditions	.012	.028	1.000	-.056	.081	
Control	Pre-intervention	Introduction	.199*	.047	.000	.082	.317	
		Established conditions	.160*	.048	.006	.040	.280	
	Introduction	Established conditions	-.039	.034	.745	-.123	.045	

b: Adjustment for multiple comparisons: Bonferroni

* Significant difference at .05 confidence interval

The results indicate that in the intervention group, there was a statistically significant difference between the pre-intervention and introduction stages, and a marginally significant difference between the pre-intervention and established conditions stages. However, the difference between the introduction and established conditions stages was not significant, thus indicating a positive effect of the colour response cards at the introduction stage, which was maintained until the established conditions stage. Though, this latter effect should be treated with caution, as the difference between the pre-intervention and established conditions stages was only marginally significant. In reference to the control group the difference between the

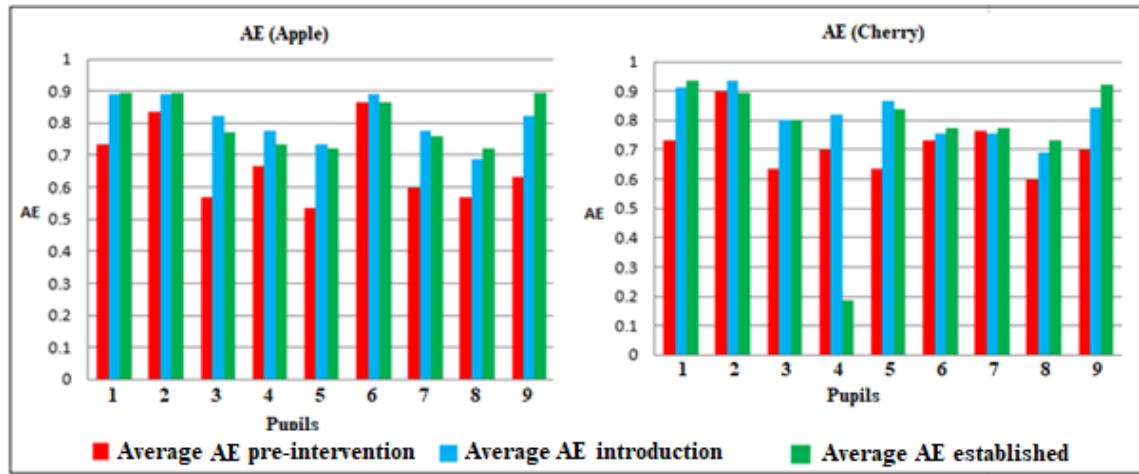
pre-intervention and introduction phases was statistically significant, as was that between the pre-intervention and established conditions phases, in both cases indicating that academic engagement *decreased* during the intervention period. In the control group, no significant difference was identified between the introduction and established conditions. This revealed that the mere fact of being in either the intervention or control group had a differential effect on pupils' behaviour (academic engagement) over time. Thus, the use of colour response cards as an intervention could be considered as an effective tool, because it helped to increase academic engagement in the intervention classes, as compared to the control classes.

4.2.3.4 Effects of Colour Response Cards on Individual Pupils' Academic Engagement in the Intervention Group

The bar charts for the Apple and Cherry Groups (see Figure 4.5) show that the pupils' academic engagement generally increased during the introduction and established conditions stages. An interesting exception was that the academic engagement of Pupil 4 in the Cherry Group fell sharply during the established conditions stage. However, this pupil was identified as unwell (with a fever) during the study and consequently, her engagement in learning may have been disrupted. Moreover, one interesting observation with respect to Pupil 5 in the Apple Group was her poor engagement prior to the intervention. Whilst she was not disruptive, she was always lost in thought, displaying a lack of interest, and appearing to be absentminded in the classroom. However, with the introduction of the colour response cards, substantial changes were observed in her behaviour; she began to engage with the lesson and was interested in using the cards, which she perceived as being playful and engaging.

Figure 4.5:

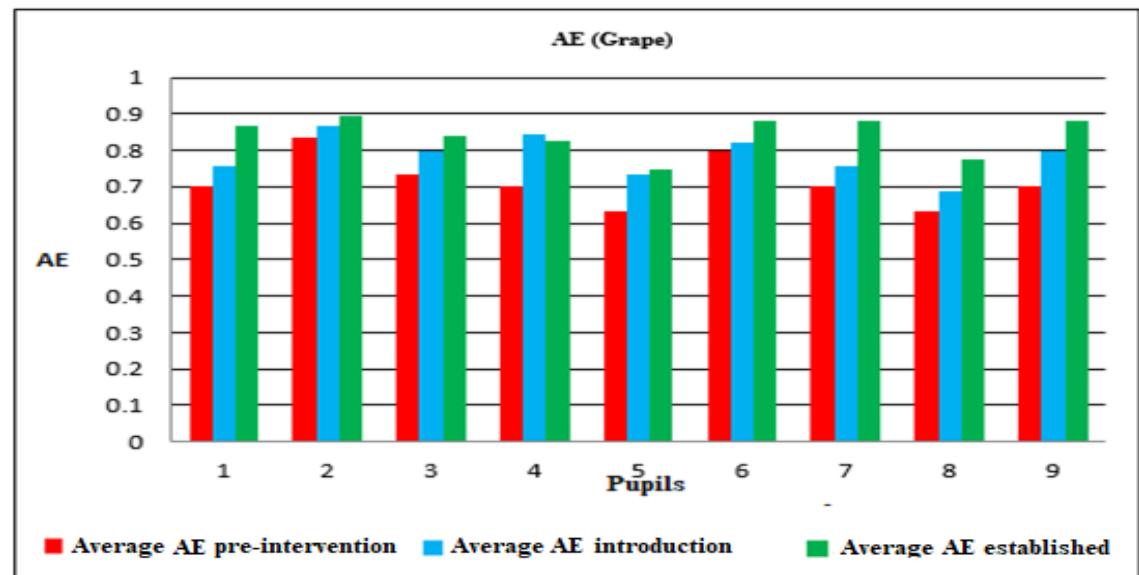
Overview of the average academic engagement scores in the pre-intervention, introduction, and established conditions observation in School A for each pupil in the Apple and Cherry Groups



Similarly, in the Grape Group (see Figure 4.6), academic engagement was noted to increase across almost all the pupils from the pre-intervention to introduction time points, and then from the introduction to the established conditions time points. However, only one pupil (Pupil 4) exhibited a steep increase in academic engagement from the pre-intervention to the introduction stage, which became slightly reduced from the introduction to the established conditions stage.

Figure 4.6:

Overview of the average academic engagement scores in the pre-intervention, introduction, and established conditions observations at School B for each pupil in the Grape Group



The bar charts clearly indicate an increase in pupils' academic engagement with the implementation of the colour response card intervention. These changes were maintained in the established conditions stage, two weeks after the researcher had left the classes, wherein all pupils showed a further increase in academic engagement, and all but one displayed a further increase. Substantial changes in positive attitudes were observed among the pupils. For instance, Pupil 9 was noted to be very shy and exhibited poor academic engagement pre-intervention. However, during the intervention, her focus shifted onto the learning and use of the cards, which every other pupil was using. Pupil 9 may have felt comfortable using the colour response cards to respond to the teacher's questions. Accordingly, her continued use of the colour response cards resulted in a change from shy to active participatory behaviour. Similarly, a positive effect of the colour response cards was observed in Pupil 8, who was ill, and this is likely to have impacted on her behaviour in class. As a result, her academic engagement was poor prior to the intervention. However, after introducing the colour response cards, she was observed to be comfortable using them and did not have to exert much effort, which was reflected in her improved academic engagement.

Therefore, the colour response cards were not only effective in improving academic engagement in the classroom, but also in building enduring positive attitudes and behaviour towards learning among the pupils. The following subsection discusses the pupils' views of using colour response cards in the experimental intervention, and their levels of satisfaction in each class.

4.2.4 Pupils' Perceptions of Using Colour Response Cards

Research Question 2 was addressed by utilising the pupils' feedback questionnaire in the intervention group. After completing the experiment (established conditions stage), the survey was conducted among the pupils. All the pupils from the three intervention classes (33 from Class 1 and 33 from Class 2 in School A; 35 from Class 4 in School B) were selected for the survey. This included those who had been observed for their academic engagement and disruptive behaviour, and others who had not been observed, but were using the cards in the intervention classes in each school. In order to simplify the process of answering the survey questions, five possible responses were designed in the form of emojis, reflecting various degrees of acceptance. These were presented in the survey (see Appendix D). The results from the pupils' responses to the closed-ended statements, scored on a scale of 1-5 (1=Strongly agree, 5=Strongly disagree), are listed below.

After administering the questionnaire to all the pupils in each of the intervention classes, descriptive statistics were carried out to measure the pupils' mean scores for the items relating to the colour response cards. Accordingly, the means of the Likert rankings for the four positive statements are presented in Table 4.15.

Table 4.15:

Descriptive statistics for the pupils' feedback on using colour response cards in the intervention classes; items measured on a Likert scale from 1 (Strongly agree) to 5 (Strongly disagree)

Items	Group						Mean of the Likert rankings	
	Apple (N= 33)		Cherry (N=33)		Grape (N=35)			
	Mean	SD	Mean	SD	Mean	SD		
The colour response cards helped me learn.	1.82	.92	2.12	.17	1.88	1.11	1.94	
The colour response cards helped me to be quiet and listen to the teacher.	1.85	.94	2.31	1.11	1.95	1.06	2.03	
The colour response cards helped me to follow the teacher.	2.18	.81	2.39	1.03	1.91	.98	2.16	
The colour response cards helped me to cooperate with peers in the classroom.	2.51	1.12	2.42	.94	2.03	.92	2.32	

Table 4.15 presents descriptive statistics for the four attitudinal scores of each of the three intervention classes, regarding their feedback on using colour response cards. Based on the mean scores, it can be seen that there were no major differences identified between the items, although the fourth item tended to elicit higher scores. The mean responses across all the intervention classes appeared to be similar with respect to the pupils' perceptions of using colour response cards.

Given that the scores round to 2 ('Agree') for three of the four questions (only the last question obtained a mean score of 2.51), it is suggested that overall, the pupils across the three intervention classes were in agreement about the positive impact of using the colour response cards. However, it was also observed that the colour response cards were perceived to be more helpful for learning than for promoting cooperation with peers in the classroom. Table 4.16 shows the frequency of the four items relating to the pupils' views of using colour response cards in the classroom.

Table 4.16:

Descriptive statistics for the relative frequency of pupils' feedback on using colour response cards in the intervention groups

Scale	The colour cards helped me learn		The colour cards helped me be quiet and listen to the teacher		The colour cards helped me to join the teacher		The colour response cards helped me to cooperate with peers in the classroom	
	Relative frequency (%)	N	Relative frequency (%)	N	Relative frequency (%)	N	Relative frequency (%)	N
Strongly Agree	39.6	40	35.6	36	26.7	27	21.8	22
Agree	40.6	41	39.6	40	39.6	40	39.6	40
Neutral	11.9	12	13.9	14	27.7	28	26.7	27
Disagree	2.0	2	7.9	8	3.0	3	8.9	9
Strongly disagree	5.9	6	3.0	3	3.0	3	3.0	22

The results in Table 4.16, above, provide a comprehensive view of the pupils' perceptions of using the colour response cards by the end of the intervention. It shows that pupils in all three of the intervention classes were satisfied with using the cards. The majority of the pupils (more than 60%) presented their views as 'Strongly agree' and 'Agree'. Perhaps the most interesting aspect is that for each of the classes, the highest mean score was for the colour response cards helping them to learn, and the lowest was for their effect on co-operation with peers. Therefore, it could be stated that the pupils' views of using the colour response cards did not vary across the intervention Groups (classes), as most of the pupils (80.2%) agreed that colour response cards helped them in learning. The impact of the cards on the pupils across the three Groups was found to be similar (in reducing disruptive behaviour and increasing academic engagement), as majority of the pupils agreed that colour response cards helped them in being quiet and listen to the teacher. However, the pupils in the Cherry Group

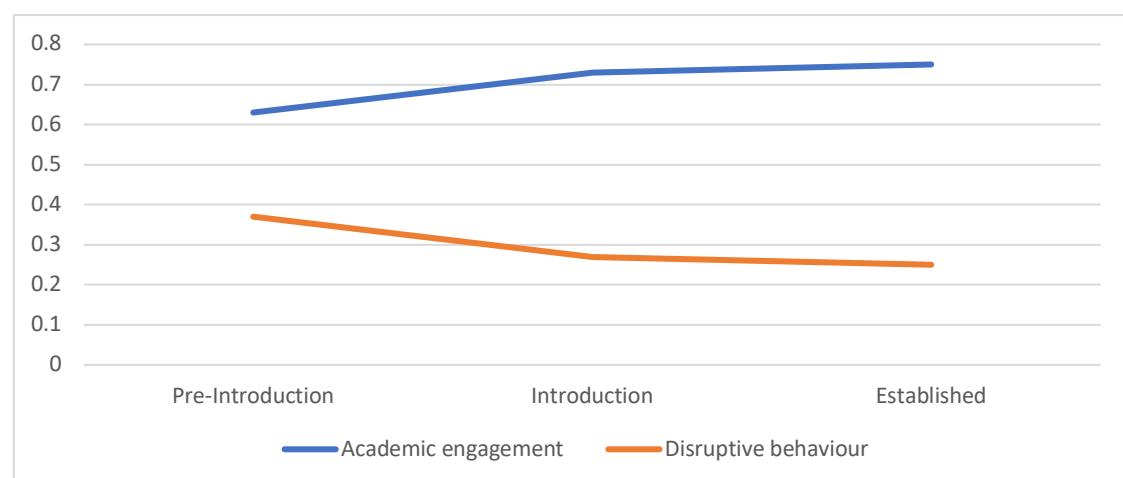
scored slightly higher than those in the Apple and Grape Groups for various items in the questionnaire. The pupils in that group were slightly more academically engaged (as identified in Subsection 4.2.3.4) and slightly less disruptive (as identified in Subsection 4.2.2.4), compared to the pupils in the Apple and Grape Groups. That is, the scores for the pupils in the Cherry Group were slightly higher than those of the other two groups.

4.2.5 Case Study: Pupil 5 from the Grape Group

In order to explore the effects of the colour response cards in depth, a case study on one pupil (Pupil 5) from the Grape Group was conducted. Pupil 5's initial level of disruptive behaviour was slightly lower than the highest disruptive behaviour score (0.46 for Pupil 5 in the Apple Group). However, the changes noted in that pupils' disruptive behaviour and academic engagement were substantial, as presented in this subsection. Pupil 5 exhibited various behaviours in the classroom before the intervention. For example, she was too shy to engage openly in the classroom activities and often indulged in talking to the two friends seated beside her. In addition, she frequently avoided direct eye contact and interaction with the teacher during lessons, which may have been due to a fear of participation and engagement. However, she was slightly more active in her individual assignments and tasks assigned by the teacher. Accordingly, her scores for academic engagement (0.63) and disruptive behaviour (0.37) were identified in the pre-intervention stage of this study, as shown in Figure 4.7.

Figure 4.7:

Change in the academic engagement and disruptive behaviour of Pupil 5 from the Grape Group in the pre-intervention, introduction, and established conditions stages



However, substantial changes were observed in Pupil 5's classroom behaviour during the introduction phase. At the beginning of the intervention, she used the colour response cards a number of times alongside her two friends. However, later, she was very active in responding to the teacher's questions using the cards. She appeared to find the colour response cards fun and engaging and stated as such to the teacher, which the latter mentioned in her interview. Pupil 5 also began to respond to the teacher's questions by answering in front of her peers without any apparent shyness. In addition, she talked less to her two friends during whole-class activities and was actively engaged in listening to the teacher's instructions. As a result, there was a clear reduction in her disruptive behaviour (0.27) and an increase in her academic engagement (0.73) scores during the introduction phase. Additionally, Pupil 5 continued to use the colour response cards in the established conditions stage, which resulted in a further slight decrease in her disruptive behaviour and an increase in her academic engagement scores. However, even while using the cards, she did not completely refrain from talking to her two friends, but the frequency was reduced, while her attention to the teacher's instructions was increased. The change in her academic engagement and disruptive behaviour scores slowed down during the established conditions phase, where similar scores were recorded for her as during the introduction phase, in accordance with the change in her classroom behaviour. Therefore, it may be understood that the colour response cards were initially very effective in reducing disruptive behaviour and increasing academic engagement, whilst their impact was identified as being slight in the established conditions.

4.2.6 Teachers' Perceptions of Using Colour Response Cards in the Classroom

This subsection presents findings for the teachers regarding their perceptions and changes in beliefs following this experiment. The qualitative data were initially collected through journal records and then in semi-structured interviews. Appendix B2 contains an example of an interview transcript and a sample of the coding undertaken for the thematic analysis, along with some instances of developing the initial and refined codes in the interview data.

As explained in the Methodology chapter (see Subsection 3.8.3), journal records were included so that the teachers could write down their perceptions after each lesson. Three participants (intervention teachers: Rawan from Class 1 in School A, Amal from Class 2 in School A, and Muna from intervention Class 3 in School B) were included in the qualitative data collection, consisting of journal records and semi-structured interviews. Muna and Amal made brief notes in their journal records, while Rawan completed hers in detail.

As the interviews were conducted after the experiment, it could have been difficult for the teachers to recollect their experiences without having kept journal records. Thus, it was anticipated that these would serve as prompts for recollection during the interviews. However, the content of two of the teachers' journals (see Appendix C) was very limited after each intervention. The teachers concerned (Muna and Amal) pointed out that they were overloaded with work and teaching obligations. Therefore, they could not dedicate much time to their journal entries.

During the interviews with Rawan, Amal, and Muna, three overall themes (Positive elements of colour response cards on pupils; Positive impact on teachers; Future use of colour response cards) were identified in the data analysis, which were further categorised into emergent sub-themes. These were identified in Chapter Three (Table 3.3 in the qualitative data analysis, Subsection 3.7.3) and are discussed in detail below.

As a first step in analyzing the qualitative data, the researcher highlighted and colour-coded rich and significant statements (in relevance to the third research questions). For instance, consider the following text from Rawan interview transcript.

Yes, the pupils looked more motivated to participate in the classroom (1). I observed them to be more engaged than before, and their attention towards the lessons had increased (2). They were mostly eager about the questions (3) that I would ask, and that they would get a chance to respond.

From the above statement, three important codes related to the perceptions of teachers regarding CRCs were identified (numbered for explanation) and coded in yellow colour. The first highlighted statement text signifies the pupils' motivation; the second signifies the pupils' increased attention; and the third signifies the pupils' increased interest. Similarly, all the transcripts were color-coded to identify the rich and significant statements from the teachers. The next step proceeded with coding process. From the highlighted text in the first step, different codes were identified. It is ensured that the codes represented and captured a datum's primary content and essence (Saldana, 2009, p.3). Accordingly, the codes were descriptive in nature summarizing the main focus of the excerpt or highlighted text as identified and interpreted by the researcher. However, the researcher was not allowed to meet the interviewees after the completion of interviews. As a result, it was not possible for the researcher to validate the interpretations of findings through follow-up interviews. Therefore,

the researcher sought clarification and validation of interpretations through emails, to which all the interviewees responded. The process of identifying codes can be understood from the same statement of Rawan's that was used earlier for better understanding.

Yes, the pupils looked more motivated to participate in the classroom. I observed them to be more engaged than before, and their attention towards the lessons had increased. They were mostly eager about the questions that I would ask, and that they would get a chance to respond.

The yellow highlighted statement represented pupils' motivation, and therefore it was coded as 'motivation'. Similarly, the green highlighted statement was coded as 'increased attention', and the light blue statement as 'increased interest'. The following statement from Rawan further explains the colour-coding and identification of codes.

I think the colour response card approach is easy to implement. It can be applied in other subjects as well. As the concepts in all other subjects are at primary [school] level, and these are the basics that pupils need to learn and retain, I feel it is beneficial to use colour response cards in other subjects as well. Therefore, I did share my experiences with the science teacher in the school.

Codes including 'easy', 'application in other subjects', 'benefits', and 'experiences' are identified from the Rawan's statement. At the end of the second step, there were 23 codes identified. The next step focused on the second round of coding, where the color-coded excerpts were further analysed. For example, if we look at the following statement from Rawan, the excerpt "*help pupils to arrange and master the work, and they start by making a decision*" is initially coded as 'performance', as it reflected pupils' performance related activity. However, in the second round, the excerpt is divided in to two codes "*arrange and master the work*" as 'performance', and "*they start by making a decision*" as 'increased confidence' because making a decision reflects the confidence in the pupils.

Yes, because they [the colour response cards] help pupils to arrange and master the work, and they start by making a decision before holding up a colour card, for example, if they know the answer, they hold up the green card and if they don't know the answer, they hold up the red card. This process helps me in deciding whether or not to proceed with the next concepts during the teaching.

At the end of second-round coding, 26 codes were identified to which various statements/excerpts were related (Presented in Table 3.3, Chapter 3). These codes were then merged to form sub-themes. Taking the example of the above statement from Rawan, four codes were identified, which included ‘performance’ (dark grey highlighted text), ‘increased confidence’ (pink highlighted text), ‘increased attention’ (green highlighted text), and ‘positive behaviour’ (light-grey highlighted text). All these four codes can be related to the self-confidence tenet, and therefore grouped under ‘self-confidence’ sub-theme. The coding and thematic analysis of all the interview transcripts are provided in Appendix B2. The identified findings under these themes are discussed in the following sections. Analysing the data based on the codes identified from interviews of each participant (as shown in Table B2.3 in Appendix B), it can be assessed that positive behaviour of the pupils was the most referred code (11 times) followed by pupils’ motivation (seven times). Some codes related to pupils, including references to their increased attention, interest, confidence; and other codes related to teachers’ perceptions about CRCs, such as easy to use, managing the classroom were referred five times in the analysis of interviews. Among the benefits of CRCs, teachers mostly reflected on the benefits through their experiences in using CRCs.

4.2.6.1 Positive Aspects of Using Colour Response Cards with Pupils

Regarding the findings for the pupils sampled from two Saudi primary schools, the following subthemes relating to a positive impact were identified.

4.2.6.1.1 Increased Attention

The findings from the interview analysis revealed that all the teachers agreed on the positive effect of using colour response cards on pupils’ behaviour, finding that using the cards not only increased their pupils’ motivation, but also, increased pupils’ attention in class. Accordingly, Rawan stated:

Yes, the pupils looked more motivated to participate in the classroom. I observed them to be more engaged than before, and their attention towards the lessons had increased. They were mostly eager about the questions that I would ask, and they would get a chance to respond.

Similar patterns were noted by Amal, who reported:

Yes, the pupils became more disciplined about participating in class. I observed that they had reduced their talking in class. They were attentive, focused, and engaged in the classroom lesson, much better than before.

Furthermore, Muna stated:

Yes, the pupils began to concentrate more and focused on the important information that I was giving to them. Pupils can have problems paying attention to their teachers from time to time, but after using the colour response cards, the pupils were more focused and paid attention to what I was saying.

In her journal record, Amal added that the pupils were able to engage fully without any assistance. In addition, Muna noted that she had been having problems controlling some misbehaving pupils and had wasted time trying to get them organised. She had once complained about this behaviour to the headteacher. However, using the colour response cards, she found that the pupils' disruptive behaviour was noticeably reduced and that the cards had encouraged the pupils to be more organised, attentive, and interactive in their classroom learning.

It should be noted here that the journal records were likely to be more accurate than the interviews in this study, as they were written immediately after each class. However, there is also the possibility that what the teachers reported was affected by their own expectations of using the cards.

4.2.6.1.2 Better Performance

Evidence of better performance was reported by all the participants. All the interviewed teachers noted that the pupils performed better in the classroom, in the sense that this strategy encouraged interaction between them through collaborative work. For example, Rawan observed:

The teacher can adopt this strategy to monitor the pupils and their performance levels, and in addition, identify higher- and lower-performing pupils in such a way as to encourage them to interact with each other... thereby increasing their academic engagement through active and collaborative approaches.

Meanwhile, Muna stated:

I have seen a gradual improvement in pupils' performance. For instance, pupils who, earlier, could not answer a question about a maths concept, are now starting to respond more quickly.

Similar patterns were noted by Amal, who reported:

The teacher can adopt this strategy to observe pupils become more motivated about learning and confident in their abilities. In addition, adopting this strategy could help create opportunities for pupils to receive continuous and specific feedback that helps them improve.

Hence, in the opinion of these three teachers, it would appear that the use of colour response cards to improve pupils' performance is an effective strategy in primary schools in Saudi Arabia. especially when they receive continuous feedback from their teachers.

4.2.6.1.3 Self-confidence

It was clear from the teachers' comments that as time went on, they perceived that the pupils felt increasingly able to trust themselves and their own ability after using the colour response cards. The pupils' self-confidence was, therefore, increased after exposure to the intervention. In this regard, Rawan reported:

Yes, because they [the colour response cards] help pupils to arrange and master the work, and they start by making a decision before holding up a colour card. For example, if they know the answer, they hold up the green card and if they don't know the answer, they hold up the red card. This process helps me in deciding whether or not to proceed with the next concepts during the teaching.

Despite this, there were also some comments about the difficulties encountered when the participants raised their colour response cards, which Rawan highlighted as follows:

As such, I could not identify any disadvantages, except I did not have a teaching assistant, I lost time in giving out and collecting the cards from the pupils. Moreover, pupils put them in their mouth. Some pupils did not want to answer, so she raised the red card to protect herself and feel safe that the teacher would not ask her to answer.

However, it would appear that other instances of lower levels of confidence were addressed by using colour response cards in the classroom. Amal observed increased levels of self-esteem as a result of engaging with the response cards, citing the following example:

I have a pupil who used to be very shy, but she has come out of her shell and seems to interact more with her peers now.

In addition, Muna observed that the colour response cards helped pupils to evaluate themselves without fear of being judged and they displayed increased self-confidence during lessons, without any fear or hesitation. For instance:

Yes, they [the colour response cards] are very useful for active learning, because they help pupils to make a decision, such as whether the answer is correct or not. If the answer is incorrect, the pupil can get help from the teacher or peers to correct it.

4.2.6.1.4 Fun and Enjoyment

The findings from the qualitative interviews with the three sampled teachers show that they perceived that the use of colour response cards was fun and easy for the pupils. Rawan, in this context, reported that one benefit of using the cards was that it was enjoyable for the pupils:

Yes, I noticed that one girl, who had a disability, started to use the cards regularly, which meant that they [the colour response cards] motivated her to engage, and she was happy using them, as well as answering correctly. Thus, I believe it helps pupils in improving their academic engagement.

Supporting the use of colour response cards for both the teacher and the pupils, Amal confirmed in the interview:

I like the strategy and I feel it was a good idea, particularly the aspect that was generated in the classroom, which stimulated both the pupils and teachers.

Muna regarded it as a great addition to her personal experience and a useful teaching method:

The colour response card pupils got so excited whenever I decided to engage them in some gameplay with the colour response cards and there was a fun atmosphere.

Muna also reported that she appreciated the fun that the colour response cards created in the classroom and the improved interaction between herself and the pupils.

4.2.6.2 Positive Impact on Teachers

Various positive elements for teachers, such as receiving instant feedback, easier classroom management, teaching strategies that were easy to formulate or modify, ease of assessment of pupils' needs, and the flexibility to adjust instructions, could be identified with respect to using the colour response cards. These positive factors were categorised into three sub-themes: managing the classroom, effective feedback for the teachers, and increased teacher confidence. These findings are explained in detail below.

4.2.6.2.1 Managing the Classroom

In this context, the colour response card strategy for teaching and learning was seen as an aid to classroom management. All the teachers agreed that pupils' use of the colour response cards

in the classroom demonstrated some benefits of that usage for the teacher. In particular, the cards helped with the management and preparation of the class especially in relation to the pupils' disruptive behaviour. Reflecting that the cards not only enhanced the pupils' confidence, but also, that of the teacher, Muna commented in her interview:

I have more control in managing the class than before, because of the experience that I had, and I have gained more confidence in my teaching. I now know how to manage the class, identify those who disturb the class, and how to engage those pupils with disruptive behaviour in classroom learning.

Furthermore, Muna wrote in her journal record:

I gave the pupils instructions on how to use the cards before the intervention lesson began. I also started praising the pupils with positive language and they became more disciplined than before, with reduced disruptive behaviour. I could sense that frequent praise in front of their peers had a positive impact on one of the pupils with highly disruptive behaviour. Later, I observed a big change in disruptive behaviour, with increased attention and engagement. The colour response cards helped me to quickly assess the pupils' engagement with the lesson, and coupled with praising them, this helped me further reduce their disruptive behaviour and made me feel that I had more control over the class than before.

Based on Muna's observations, it can be seen that in the teachers' view, positive teaching also had an impact on the pupils' disruptive behaviour and academic engagement. The pupils appeared to be motivated when they receive positive feedback from their teacher in front of their peers and which, thus, seems to increase their sense of competence, academic engagement, greater participation in the classroom teaching, and a reduction in their disruptive behaviour. Furthermore, it should be noted that these cards facilitated and encouraged the teachers to feel confident being able to encourage and motivate their pupils, which resulted in the change in those teachers, and also in the pupils' classroom behaviour. Through the lens of SDT, in this way the CRCs appeared to increase feelings of competence for both pupils and teachers. Moreover, from Amal's perspective, the use of colour response cards in the classroom provided the teacher with an instant image of pupils' understanding of the instruction which, thus, allowed, on the one hand, pupils who had difficulty understanding reflect on their doubts and difficulties, and on the other hand, the teacher to provide constructive feedback for all pupils:

Yes, they helped me to organise my work, for example, I asked the pupils to hold up one card when I asked them questions. They responded with the green and red cards. I

could easily identify the percentage of pupils who understood the concept and those who didn't. I could identify those who had raised red cards, ask them about their doubts, and was able to provide instant feedback. This not only cleared the doubts of individual pupils, but also, all similar doubts among other pupils.

Supporting the benefits of using colour response cards, Rawan believed that this strategy could improve teacher-pupil communication and sense of relatedness, in terms of the SDT, in the classroom:

Yes, using colour response cards can help me to communicate with pupils, which is the most important aspect of classroom management. They [the colour response cards] also help me to build strong relationships with pupils and encourage them in their self-learning process. In addition, I should say, that this is a great tool for motivation and achievement, and I work more at engaging the pupils in the subject matter.

4.2.6.2.2 Effective Feedback for the Teachers

The interview analysis revealed that the use of colour response cards helped the teachers obtain instant feedback, as a result of which they could evaluate the pupils' level of engagement and understanding of the lessons being taught. Focusing on this, Rawan highlighted the fact:

Maybe it does, because as I mentioned before these cards make me notice my pupils more than before. Therefore, their behaviour toward the lesson and how they respond I have noticed more than before. They helped me to organise my work, for example, I asked the pupils to hold up one card when I asked them questions. They responded with the green and red cards. I could easily identify the percentage of pupils who understood the concept and those who didn't. I could identify those who had raised red cards, ask them about their doubts, and was able to provide instant feedback, which not only cleared the doubts of individual pupils, but also all similar doubts among other pupils.

The other teachers agreed that the colour response cards provided an effective method for them to assist pupils. Muna explained:

Yes, they help me, because this colour response card technique is a quick way to get feedback from pupils. When some pupils raised the red card, I realised that I needed to explain more, and they helped me ascertain how well a pupil understood the lesson.

The colour response cards conveyed the pupils' level of understanding and helped the teacher to adjust her instructions according to the pupils' learning needs. In this context, Amal stated:

This type of card can have multiple functions, such as identifying whether the pupils understand the lesson or not, or whether they have any questions about the lesson. I can put the pupils holding up green cards together, in order to spend time helping the pupils who are holding up red cards.

4.2.6.2.3 Increased teacher confidence

It was deduced from the qualitative interview data whether the colour response cards were instrumental in engendering-increased confidence among the teachers, with the findings suggesting that this was the case. Accordingly, Rawan expressed that pupils' increased engagement, attitudes and motivation when using the colour response cards in the classroom had a positive impact on her perceived confidence in teaching, stating:

To some extent, yes, because I have noticed now the pupils are better than before and I feel happy to move on. They are happy that their doubts are cleared instantly and are more active and motivated towards learning. This change in behaviour and pupils' attitudes towards learning helped me to reflect positively on my teaching practices because of the change I noticed among the pupils.

From the perspective of SDT, this provides further evidence of an increased sense of competence in this teacher, as a result of using the CRCs.

Writing in her journal record, Muna also mentioned that seeing change in the pupils' behaviour and learning increased her sense of confidence to teach, stating that:

During lesson three I realised that many green cards were raised, and I gave them [the pupils] positive feedback. Moreover, I felt more confident. The positive approach of providing feedback motivated the pupils. As a result, they changed their attitudes towards learning, and became more disciplined and attentive.

Despite the difficulties Amal experienced when using the colour response cards with the pupils, she believed that the positive results on pupils' learning was her main concern and she felt satisfied with that:

I do not have an assistant teacher, so it uses up my time allocating and collecting them [the colour response cards] from pupils. I feel that addressing the questions from all the pupils instantly during lessons in the classroom led to more time being spent on teaching and feedback. As a result, it took more time to complete the lessons and I am lagging behind the schedule in completing the curriculum on time. However, I am happy that the pupils have become more actively engaged in learning and are more disciplined than before.

4.2.6.2.4 Adjusting Instructions According to Pupils' Needs

Of the three teachers who were interviewed, one mentioned the benefit of using colour response cards in terms of adjusting her instructions according to her pupils' needs. Also, it seems that

using the cards enabled the teacher to boost learners' sense of competence because the instruction was more closely tailored to individual needs. Thus, Muna opined:

Using the colour response cards not only encourages the pupils' self-assessment, for it can also help teachers adjust their instructions according to the pupils' learning needs. It is important that pupils' basic needs are accurately assessed and accordingly, the teachers need to adopt strategies to address them.

4.2.6.3 Future Use

Some general comments were made about the future use of colour response cards, which could be classified into two sub-themes. All three teachers reported that it was easy to use them and it is worth sharing and using them in other subjects.

4.2.6.3.1 Sharing Their Experiences with Colleagues

Amal stated that she planned to speak to her colleagues about her experiences of mastering and using this teaching and learning approach. Similarly, Rawan perceived the use of the colour response cards as beneficial for both the teacher and the pupils, therefore, it seemed necessary for her to share the strategy with other colleagues in the school:

I think the colour response card approach is easy to implement. It can be applied in other subjects as well. As the concepts in all other subjects are at primary [school] level, and these are the basics that pupils need to learn and retain, I feel it is beneficial to use colour response cards in other subjects as well. Therefore, I did share my experiences with the science teacher in the school.

Muna's reflection on her positive experience using colour response cards and its positive impact on the pupils learning and behaviour seemed worthy to be shared with and used by other colleagues to improve their teaching and their pupils' learning:

One important thing that I observed was that using colour response cards, I could easily identify pupils who had difficulties in learning and who could not actively engage in learning; as a result, they tended to engage in the disruptive behaviour displayed by other pupils. However, when colour response cards were implemented, I observed that those pupils who were less attentive were actively engaged and exhibited more positive behaviour. In addition, positive feedback from me made them more motivated, and they actively engaged in classroom lessons. I would like to share my experiences, so that other teachers can also benefit from them.

4.2.6.3.2 Benefits of Using Colour Response Cards in Other Subjects

The benefits of using colour response cards in other subjects were pointed out by the interviewees. From their responses about future plans, it would appear that they suggested to use them in other subjects, with Rawan affirming:

Yes, I believe, it can be implemented across various subjects, as it is easy to use and does not take much effort in learning and training...

However, Amal proposed commented that some teachers might need more support and training to be able to implement this strategy in the classroom:

Yes, I will do. But I believe that in order to use these cards, teachers need more training on the functions of the cards and how to use them properly, for those who are interested in applying this strategy in the classroom.

Meanwhile, after she implemented the colour response cards in her teaching, Muna expressed the change in her prior attitude regarding the use of the strategy in classroom, saying that:

To be honest with you, I have changed my mind after using colour response cards, because I would definitely use them again in the classroom... It was an eye opener for me, and it changed my perspective on how to manage the class.

Overall, all teachers reflected that this strategy had helped them with classroom management, which had a beneficial impact on them and on their pupils, both academically and socially.

4.3 Chapter Summary

This study involved exploring the impact of using colour response cards on pupils' disruptive behaviour and academic engagement in two different schools. In the pre-intervention stage, the academic engagement and disruptive behaviour scores were collected in just one session, whereas in the introduction stage, they were collected more than once. The disruptive behaviour scores for the control group were observed to be higher than for the intervention group in the pre-intervention test. However, more than one set of observations should have been conducted in the pre-intervention stage.

It should be noted that the control group displayed more disruptive behaviour in the pre-intervention stage, compared to the intervention group. As the three-month period of the study

progressed, the pupils' behaviour (disruptive behaviour, academic engagement) was positively affected by the adoption of a colour response card strategy: their use reduced the incidence of disruptive behaviour and improved academic engagement, with ANOVAs and post-hoc Bonferroni tests showing the differences to be large. The effect sizes of .692 (disruptive behaviour) and .628 (academic engagement) were large for the difference between the intervention and control groups, applying Cohen's (1988) estimation. The control group had greater estimated disruptive behaviour and lower academic engagement than the intervention groups who used the colour response cards in the classroom. The means in the established conditions revealed that the colour response cards reduced disruptive behaviour and improved academic engagement as the pupils became accustomed to them over time. There were minor differences between the two schools in terms of the effects of using colour response cards on academic engagement.

For School A, there were differences in pupils' behaviour (disruptive behaviour, academic engagement) between the pre-intervention, introduction, and established conditions stages. However, no major differences emerged between the introduction and established conditions stages. The pupils' individual profiles were also examined with respect to their disruptive behaviour and academic engagement in the three stages of the intervention classes, with all displaying a similar pattern. However, it should be acknowledged that the changes in the pupils' behaviours were possibly due to factors other than using the colour response cards, for example, the teacher effect, where the class teachers for the intervention group elicited a greater decrease in disruptive behaviour and higher increase in active engagement than the teachers of the control classes, irrespective of whether the cards were used.

In reference to the qualitative analysis, the overall impact of the colour response card technique appears to have been very positive for both teacher and pupil behaviour. Firstly, there was a positive impact on the pupils' behaviour as a result of engaging with the teachers: they were more motivated in the classroom, which improved the performance of a few pupils. The findings revealed the benefit of active participation in class through using the cards, which promoted the pupils' self-confidence, as well as adding an element of fun to the lessons. Secondly, the teachers experienced that it was easier to manage the class when using the cards. Furthermore, the colour response cards helped the teachers to gather feedback from their pupils, made the teachers feel better in themselves, and facilitated the adjustment of instructions to pupils' needs. Thirdly, the findings revealed the teachers' willingness to use colour response cards in future, their intention to share their experiences with colleagues, and

their consideration of the benefits of using the cards for other subjects. However, these are the findings for three teachers and 101 pupils across three intervention classes in two primary schools. It does need to be reminded that the views of these teachers and pupils could reflect changes that were going to take place anyway, such as the pupils becoming accustomed to the classroom approach, the pupils advancing in age, or the teachers becoming more settled with their classes and pupil groups.

While the above results suggest that colour response cards reduce disruptive behaviour and increase academic engagement, it should be stated that the difference between the intervention and control groups might not have solely been due to the effect of their being used by the teacher. Instead, the effect could have been due to the intervention group teachers being more engaged than the control group teachers. The fact that there is some consistency across the three intervention classes in terms of all the pupils feeling that the cards were effective would suggest that this is the case. The next chapter discusses the findings.

CHAPTER FIVE: DISCUSSION

5.1. Introduction

This study investigated the impact of colour response card usage on the behaviour of pupils and teachers in primary schools in Saudi Arabia. The original research aims consisted of examining the impact of using the cards on teacher-pupil classroom interaction in girls' primary schools in Saudi Arabia (in response to the main research question), after which three sub-questions emerged from a review of the literature. First, it was investigated how colour response cards influenced pupils' academic engagement and disruptive behaviour in Saudi mainstream schools. Second, the pupils' views of using the cards were explored, and third, the teachers' perceptions of using them in the classroom were studied. In this chapter, the findings to address these research questions are discussed with reference to theory and prior empirical research, as presented in the Literature Review (Chapter Two), along with other relevant literature.

5.2. Influence of Colour Response Cards on Pupils' Academic Engagement and Disruptive Behaviour in Saudi Mainstream Schools (RQ1)

This research question was primarily addressed using colour response cards as an intervention, specifically observing their effects on pupils' behaviour (academic engagement, disruptive behaviour) for a period of three months. Overall, the findings from the observation and experiment showed that both the teachers and pupils were exercising complete adherence to the colour response card strategy towards the end of intervention. This suggests that the technique had become effectively embedded as a routine in their teaching and learning approaches. The results of the observation data in relation to pupils' academic engagement and disruptive behaviour are discussed here from three perspectives.

Firstly, the findings across one intervention and one control group, made up of five classes in two schools, revealed greater improvement in pupils' engagement in the intervention group than in the control group, consequently supporting the findings from previous studies

(Duchaine et al., 2011; Heward et al., 1996; Marmolejo et al., 2014). However, this current study differs from previous work in that it was limited to girls' primary schools and hence, no boys were included in the study. It was found that the colour response cards in the intervention group led to an overall improvement in pupils' classroom engagement, in terms of reducing their disruptive behaviour. A similar study by Singer et al. (2013) demonstrated that response cards were an effective intervention when implemented for reading, as they resulted in favourable pupil outcomes. However, the pupils in the control and intervention groups were not matched for initial levels of academic engagement or disruptive behaviour prior to the study. Meanwhile, there was only a slight difference between the groups in terms of academic engagement (see Table 4.11, Chapter Four, p.157). However, in relation to the disruptive behaviour scores (Table 4.7, Chapter Four, p.150), the difference between the initial scores in the intervention and control groups was quite wide, with the control group displaying higher rates of disruptive behaviour than the intervention group.

As the pupils' disruptive behaviour varied in each class, differences in initial levels of academic engagement and disruptive behaviour were to be expected. The fact that the rate of disruptive behaviour was much higher in the control than in the intervention group means that it is perfectly possible that the latter was simply better behaved than the former from the outset. The researcher was aware of this potential confounding factor and relied on changes in the level of disruptive behaviour during the pre-intervention and established stages, so as to better analyse the results. However, it does not necessarily mean that the pupils in the intervention group did not engage in disruptive behaviour, as the initial findings before intervention (see Table 4.7, Chapter Four, p.150) indicated that they did. Therefore, this study was focused on changes in academic engagement and disruptive behaviour scores at three stages: the pre-intervention, introduction, and established time points, in order to better compare the results relating to the impact of colour response cards on pupils. However, levels of disruptive behaviour in the control group before the intervention were higher than they were in the intervention group. As a result, it may be assumed that the pupils in the intervention group displayed less disruptive behaviour than the control group prior to the intervention. Therefore, further research is required, with groups matched more closely at the pre-intervention stage to verify the findings.

Secondly, in relation to RQ1, the findings for the intervention group across the three time points of the intervention were studied. Here, the results for academic engagement and disruptive behaviour varied slightly across all the targeted pupils in the three classes,

comprising the intervention group at the three abovementioned time points. In an analysis of the change from the pre-intervention to the introduction stage, the colour response cards appeared to effectively reduce pupils' disruptive behaviour and increased their academic engagement in the intervention classes in both schools. The colour response cards provided a positive effect in improving academic engagement from pre-intervention to the introduction stage, though the levels of academic engagement observed in the established condition stage were not extremely different compared to the gains observed in introduction stage. The changes observed in academic engagement of pupils, from the introduction stage to the established condition stage, therefore reflected minor improvements which did not reach statistical significance. Similarly, difference in academic engagement levels between the pre-intervention and established condition stages were observed in the control group, where a reduction in academic engagement was shown. However, no difference between the introduction and established conditions stage were observed in the control group). The outcome indicates that either the intervention group or control group had a differential effect on pupils' behaviour (i.e., academic engagement) over time. The increased academic engagement in the intervention classes in comparison to the control classes indicates that the use of colour response cards as an intervention was effective for gaining better engagement of pupils in the classes.

As levels of academic engagement increased in both schools over the course of the intervention, the pupils' disruptive behaviour decreased. Therefore, it may be deduced that the continued application of colour response cards can improve academic engagement in the long term, reflecting the pupils' support and interest (attitudes) towards the intervention. Furthermore, the findings from the pupils' survey indicated that they liked and were motivated to use the colour response cards, which was also identified from the teachers' interview responses. Hence, Cognitive Evaluation Theory is supported, wherein pupils can be extrinsically motivated (by colour response cards), potentially leading to intrinsic motivation (Ryan & Deci, 2000).

The slight variation in the extent of changes in academic engagement and disruptive behaviour among the pupils from the two schools from which the sample was recruited could be attributed to different teachers and classroom environments. In turn, the pupils' different abilities and behaviours in the two schools possibly impacted on the outcomes. Despite the two focal schools being located in the same region, factors such as teaching approaches, pupils' attitudes, teachers' roles and competencies as well as the school/classroom environment may have differed. Therefore, these factors can be considered to bear upon the slight variations in

results between the two schools. Accordingly, it is not yet known how typical the findings are for Schools A and B, as a bigger sample of schools would need to be studied.

5.2.1. Impact of colour response cards on individual pupils' disruptive behaviour and academic engagement

Thirdly, behavioural change in individual pupils was studied in relation to RQ1. The individual results presented in Chapter Four (see Subsection 4.2.2.4, p.154; Subsection 4.2.3.4, p.160) reflected different levels of disruptive behaviour at the three stages of the intervention. Here, the results at the three test times were not uniform across all pupils. For instance, the disruptive behaviour of one pupil (Pupil 7 from the Cherry Group in School A) was slightly increased at the introduction time point. From the observation records, it was noted that the classroom environment and activities of other pupils influenced her, reducing her attention levels and causing her to eventually stop using the colour response cards. For instance, while Pupil 7 was in the classroom, other pupils from a different class were playing, one of whom was her sister. The noise of play appeared to arouse Pupil 7's curiosity about what her sister was doing, which shifted her attention away from her learning. This shows that pupils can be distracted in various situations while interacting with their teacher in the classroom. A number of studies (Bittinger, 2015; Duchaine et al., 2018; Pellowe et al., 2015; Twyman, 2018) have found that colour response cards can reduce such challenging behaviour and increase learning engagement. However, the case of Pupil 7 indicates that whilst colour response cards can be effective in reducing disruptive behaviour, external influences, such as disturbances in the school environment (as in the case of Pupil 7) could likewise influence their impact on pupils. Therefore, for better results of using colour response cards, other influencing factors, such as the school environment should be managed effectively.

Consequently, it is very important to build positive pupil-teacher interactions, as identified from the teachers' interviews findings (see Subsection 4.2.6, p.166), in order to enhance pupils' attitudes towards learning, thereby improving their level of engagement. This process can be inferred from the changes observed in Pupil 5 (in the Grape Group) during the intervention. She was active and had a good relationship with her teacher, resulting in active engagement, whereby she completed all assignments and was interactive in the classroom (see Subsection 4.2.5, Chapter 4, p.165). Furthermore, the use of colour response cards also reflected peer-peer influence. For instance, Pupil 3 and Pupil 7 from the Grape Group, who were friends with Pupil 5 in the same group, were active from the beginning in using the cards.

This appeared to motivate Pupil 5 (from the Grape Group) also to use the cards. It demonstrated that positive interactions between pupils can lead to increased academic engagement. In addition, peer influence, the teacher's role, and pedagogical/teaching approaches are other factors that can facilitate a positive and collaborative learning environment.

Furthermore, to achieve effective results, the need for persistent and continuous use of colour response cards was identified. Whilst there was a decrease in disruptive behaviour among most of the pupils in the Apple and Cherry Groups after the intervention, there was a slight increase among a few pupils (Pupils 3, 4, 5, 6, 7 in the Apple Group; Pupils 2, 5 in the Cherry Group), compared to their disruptive behaviour during the intervention. Hence, it was evident that when using the colour response cards, disruptive behaviour was reduced. However, after completing the intervention, once the pupils had stopped using the cards, their disruptive behaviour was observed to increase. Therefore, it would appear that the continuous use of these cards is essential for controlling disruptive behaviour in the classroom.

The findings further support the pupils' behavioural engagement in learning. For instance, those using the colour response cards were observed to be involved and persistent, exhibiting deep concentration while completing their tasks. This reflected good levels of emotional engagement and increased willingness to learn by responding positively to the teacher's instructions, as identified by Fredricks et al. (2004). Because the pupils were physically involved in play and learning with non-digital activities in class, namely, using colour response cards, it is suggested that greater engagement was observed. This supported the learning of new skills, consequently reflecting cognitive engagement, as identified by Parsons and Taylor (2011). Thus, the findings in this study demonstrate the pupils' emotional and cognitive engagement as a result of using colour response cards. This supports Attard (2014), who identified engagement in mathematics as the 'coming together' of cognitive, emotional, and behavioural engagement, thereby resulting in pupils enjoying and valuing the subject. Moreover, as colour response cards are easy to use, none of the pupils had any difficulty with this teaching and learning strategy; the pupils' ability to use them was sufficient for adopting the tool.

It has been ascertained that behavioural engagement is associated with involvement, persistence, and concentration; it occurs when the task in the activities matches the abilities of pupils (Finn et al., 1995; Phethean & Clarke, 2014). For example, the task of raising red card when the pupils want to answer 'No', and green card when they want to answer 'Yes' to the

teacher's query was clearly understood by them and the activity thus matched with the pupils' abilities to respond with colour response cards. Moreover, the pupils in this study exhibited behaviours, such as persistence, involvement, and deep concentration, in their colour response card activities, revealing their interest and positive engagement with the intervention tool and displaying good levels of behavioural engagement. During the interview, Teacher Muna expressed the view that the combination of colour response cards usage and encouragement in front of peers led to an increase in the academic engagement of the pupils, with greater participation in the teaching sessions, whilst also leading to a reduction in their disruptive behaviour. However, encouragement (appreciation from teacher) is a different aspect of research, which is not within the scope of using colour response cards. According to SDT the role of teachers' support for pupils' needs is highly emphasized (Deci & Ryan, 2000), in the sense that teachers' immediate and non-evaluative feedback is argued to enhance learners' academic competence.

Bondy and Tincani (2018) used active pupil responding (ASR) to measure pupil engagement, which is defined as "an observable pupil response made to an instructional antecedent" (Heward, 1994, p.286). ASR focuses directly on observable pupil behaviour, rather than indirectly applying measures, such as instructional time or opportunities to respond. Some studies (Armendariz & Umbreit 1999; Gardner et al., 1994; George, 2010; Godfrey et al., 2003; Heward et al., 1996; Narayan et al., 1990; Randolph, 2007) have identified the effectiveness of ASR in promoting the acquisition of academic information and reducing problematic behaviour. Accordingly, this current study highlights the value of specific instructional strategies (colour response cards) to promote ASR as an approach to increasing academic engagement and reducing disruptive behaviour. This can be seen from the increased use of colour response cards by Pupil 5, Pupil 3, and Pupil 7 from the Grape Group, across the three time points. The use of response cards is an empirically supported intervention technique, identified as promoting ASR during various learning activities, such as group lessons, instant feedback, improving pupils' engagement, and providing insights for teachers into their pupils' comprehension of the information being taught (Berrong et al., 2007; Heward et al., 1996; Horn, 2010). Based on the interview findings (see Subsection 4.2.6, p.166), it can be concluded that colour response cards are easy to implement and effective for increasing pupils' active responses in the classroom.

The colour response card technique enabled the pupils to participate more actively in class, as identified from the increased academic engagement that the observational data

revealed in both School A and School B. This increase in academic engagement was identified across all the pupils from the pre-intervention to the introduction stages in both schools. However, a number of pupils (Pupils 3, 4, 5, 6, 7 from the Apple Group; Pupils 2, 4, 5 from the Cherry Group; Pupil 4 from the Grape Group) reflected a slight decrease in the established stage, compared to the introduction one thus suggesting that continuous use of the cards is essential for managing pupils' disruptive behaviour and academic engagement.

5.3. Pupils' Views of Using Colour Response Cards (RQ2)

The findings from the pupils' survey were presented in Chapter Four (see Subsection 4.2.4, pp.162-165) and can be used to draw various conclusions about their perceptions of using colour response cards in the classroom. The pupils responded positively to the prospect of using cards in this setting, as it was considered as an effective approach to improving their learning. In addition, the evidence from the interviews (see Subsection 4.2.6, p.166) suggests that colour response cards constitute an effective approach for developing positive behaviour towards learning among pupils. Moreover, the approach has been proposed as an effective secondary intervention within the school framework as part of positive behaviour support (PBS), which is focused on monitoring pupils' behaviour and progress to help create positive and supportive classroom environments (Ross et al., 2012). It is stated here that the use of colour response cards is consistent with the PBS approach adopted in schools.

The quantitative results (pupils' survey) from Chapter Four (see Table 4.16, p.164) revealed that more than 80% of the pupils believed that using colour response cards had facilitated their learning, whilst over 75% believed that it had enhanced their engagement in active learning and improved their positive behaviour (remaining quiet, listening). It was evinced from the interview findings (see Subsection 4.2.6, p.166) that these good interactions and responses engendered positive relationships between the teachers and pupils. In turn, it can be suggested that these positive interactions fostered the pupils' active engagement in learning, producing results that are consistent with those of previous studies (Archambault, 2017; Korpershoek et al., 2016; McGrath et al., 2017; Shin & Ryan, 2017).

A total of 101 pupils stated that the colour response cards had helped them follow their lessons and listen to their teacher more attentively. Moreover, the survey results indicated that the cards had helped the pupils develop good relationships with their peers and teachers. Similar results have been identified in studies using other interventions, such as the Good

Behaviour Game (Aggarwal, 2018; Lynch & Keenan, 2018; Rubow et al., 2018), response card system (Lambert et al., 2006; Paulish, 2018), flipped learning (Chen & Su, 2018; Unamba et al., 2006), and jigsaw methods (Dewitt & McLuskie, 2019; Marquez et al., 2017; Ural et al., 2017). However, unlike these approaches, colour response cards require less effort to implement, but can deliver similar results to those produced by high-cost interventions. Moreover, Skibo et al. (2011) concluded that response cards can improve active response and decrease disruptive behaviour more effectively than the hand-raising approach, constituting an easy way to engage with teachers in learning. Accordingly, the present study findings reveal that most of the pupils were actively involved and joined their teachers in learning; they reported believing that the colour response cards had helped them actively engage in their own learning more than for promoting cooperation with their peers.

Peer influence is another factor that should be considered, as it can have both a positive and negative impact on pupils. While a pupil with a high level of disruptive behaviour is likely to disturb his or her peers, those with positive attitudes towards learning can influence their peers by enhancing their attitudes to learning (Nelson, 2007; Rubow et al., 2018). Hence, when evaluating pupils' behaviour in classroom, it may be necessary to consider the influencing factors in the classroom and overall school environment, and also the pupils' attitudes and behaviour. In this context, Addi-Raccah (2019) pointed out that pupils' attitudes to their teachers vary, and that they can be considered from two perspectives: socio-cognitive and academic. While the socio-cognitive perspective focuses on building emotional relationships between pupils and teachers, the academic one pertains to the learning component. It is evident from the findings from the pupils' feedback that the colour response cards had improved pupil-teacher relationships/interactions and enhanced pupils' engagement, thereby indicating both socio-cognitive and academic benefits.

Whilst the aim of using colour response cards was to enhance academic engagement and not to improve cooperation, it is interesting to note that the pupils commented on this point, claiming that the cards had helped them become more cooperative in class. This suggests that the cards not only impacted academic engagement and disruptive behaviour, but also improved relationships in the classroom, as a by-product of the process. Despite colour response cards not being specifically designed with this end in mind, they appear to have had this indirect effect. Consequently, it could be concluded that pupils' overall improved classroom engagement and lower levels of disruptive behaviour produced a calmer atmosphere, perhaps leading to better peer-peer and pupil-teacher relationships, thereby allowing space for

cooperation. The focus in the classroom subsequently became on good behaviour, rather than dealing with disruptive behaviour. As pointed out by one of the teachers (Muna 2019), the disruptive behaviour of a few pupils can negatively influence many or all other pupils in the classroom, as they tend to mimic each other. In the same vein, Glynn et al. (2010), Kellum et al. (2001), and Randolph (2007) found that active engagement led to improved relationships, which could effectively reduce disruptive behaviour, thereby supporting the indirect benefits of colour response cards in improving the classroom atmosphere. Thus, the findings from the pupils' feedback survey revealed that they believed colour response cards to be an effective approach to interacting with the teacher in an efficient and effective way.

5.4. Teachers' Perceptions of Using Colour Response Cards in the Classroom (RQ3)

The semi-structured interview data gathered in this study indicated high fidelity in the way that the teachers implemented the colour response card intervention. Here, the teachers were given abundant suggestions for opportunities to encourage pupils to respond using the cards during classroom sessions. As mentioned earlier, the researcher met with the participating teachers on multiple occasions before the intervention to answer any questions and provide additional coaching. These additional coaching and feedback meetings could have accounted for the effective use of the cards and therefore, the low levels of disruptive behaviour among the targeted pupils. Furthermore, this support from the researcher may have contributed to the high levels of implementation observed among the teachers.

Meanwhile, an increase in academic engagement and a reduction in disruptive behaviour among individual pupils in the intervention group during two stages (introduction, established) could relate to the teachers' frequency of colour response card usage in these classes. An interesting finding (although not part of the original research focus) related to the frequency with which the teachers used the cards. During the total of six sessions (at the introduction and established stages) involving the cards, Teacher One (Rawan) used them 37 times (an average of six times per class), whilst Teacher Two (Amal) used them 43 times (an average of seven times per class), and Teacher Three (Muna) used the cards 38 times (an average of six times per class). Therefore, on average, the colour response cards were used 6-7 times per lesson, indicating one use every 10 minutes to assess the pupils' learning and understanding of the classroom instruction. Despite not being part of the study, it would be useful to share this information with schools so as to determine an optimal number of uses of the CRCs to gain improvements in the pupils, behaviour and engagement.

It is important to keep pupils engaged in learning activities, in order to reduce their disruptive behaviour (Watson et al., 2016). Therefore, interventions for reducing disruptive behaviour must be fun and engaging to capture pupils' attention in the classroom (Watson et al., 2016). The findings derived from the teachers' perceptions of using colour response cards revealed that they felt that the pupils considered their use to be fun and interesting. In addition, the teachers stated that using the cards had increased their pupils' attention and self-confidence, leading to active learning engagement.

The data analysed from the teachers' interviews also showed that they had observed an increase in the pupils' responses, especially among those who were previously inactive or shy about responding to questions or engaging in tasks. Improving pupils' performance has been one of the main challenges identified in Saudi schools, which places increasing pressure on teachers (Borg & Alshumaimeri, 2012). A few studies (Duchaine et al., 2011; Heward et al., 1996) have reported that by adopting colour response cards in the classroom, learning behaviour can be improved. and active engagement can be engendered, thereby resulting in an enhancement of pupils' performance. Hence, the active learning strategies that are integral to this technique would appear to have a positive effect on pupils' classroom engagement. This may be due to pupils undertaking activities in class with the guidance of their teacher, who gives immediate feedback. In such educational settings, pupils often develop high-level thinking skills by actively engaging in learning (Duchaine et al., 2011). This present study may therefore be of use to Saudi schools as part of a package of measures to improve pupils' performance. Moreover, pupils would be encouraged to think both within and outside class.

If a pupil becomes distracted, the teacher should be able to identify why and devise a solution, or watch out for signs of a pupil needing emotional support due to feeling anxious, scared, or stressed, which can likewise be distracting (Wiltshire, 2012). A small number of studies (for example, Bittinger, 2015; Duchaine et al., 2018; Pellowe et al., 2015; Twyman, 2018) have reported that the use of colour response cards can be fun and engaging, as a result of which, pupils' attention and interest in learning may be considerably improved. However, it is important for teachers to be aware of what might be distracting a pupil if they are to help him or her. Engaging and managing pupils in the classroom has been identified as one of the most challenging tasks of a teacher (Bobis et al., 2016; Christene et al., 2019; De Frondeville, 2009). The classroom environment can be affected by various types of disruption, which not only impact on pupils' engagement, but also, on the teacher's presentation and teaching practices (Hopman et al., 2018; Lum et al., 2017).

In addition, the use of colour response cards amounts to time saved in assessing pupils using oral questioning, which would otherwise require a more time-consuming procedure. In contrast, the use of written response cards in active learning can involve assessing pupils with a long list of questions, which unnecessarily takes up time. Hence, colour response cards are a preferable alternative, as pupils can answer questions immediately by presenting a card in response, thereby simplifying their engagement in the classroom activity. Moreover, the colour response card technique allows the whole class to answer the teacher's questions, reflecting their level of understanding and offering insights to teachers, concerning the number of pupils who comprehend the information presented in class (Marmolejo et al., 2004). Response cards have been empirically assessed as an active teaching approach in a variety of academic areas and school settings, with different types of participants, where high effect sizes have been found in the reduction of disruptive behaviour, as identified from Randolph's (2007) meta-analysis of 18 articles. Similarly, the findings in this study indicate that the active engagement of pupils in learning reduces their disruptive behaviour with the continuous use of colour response cards. The present study's findings, therefore, support the notion that pupils' active engagement in learning can be elicited with colour response cards.

The development of pupils' skills and competencies through the use of colour response cards and the opportunity to give immediate feedback are considered to be important elements of Basic Psychological Needs Theory (BPNT) (Painter, 2011; Ryan & Deci, 2000). In addition, the teaching strategies that are supported by such cards (fun, engaging, supportive, collaborative) were also found to contribute to higher levels of pupils' engagement in learning. That is, improved interactions with teachers through the use of colour response cards engaged pupils more actively in their learning and eventually led to the development of more positive attitudes to learning among them. These interactions created a supportive and motivated classroom environment, identified as influencing pupils' behaviour in the classroom. Thus, Causality Orientations Theory (COT) (Deci & Ryan, 1985; Koestner, 1986), which states that individual motivation can promote change in a person's behaviour, is supported and validated by the current findings.

According to the interview findings, the benefit for the teacher of using a colour response card strategy lies in being able to obtain rapid feedback and evaluate pupils' knowledge. It can be seen from the interview analysis that the use of the cards helped the teachers gain instant feedback, as a result of which they could evaluate pupils' level of engagement and understanding in the lessons being taught. Accordingly, feedback (see Subsection 2.7.3,

Chapter Two, p.80-81) is considered to be an important element of the learning process that can be affect pupils' engagement. If pupils do not understand the teacher's instructions, it might not be possible for them to engage further in the lesson or with the concept being taught, resulting in an increase in their disruptive behaviour. Therefore, this study supports the literature indicating that feedback on lessons in the classroom or on pupils' queries needs to be given immediately by teachers, in accordance with their level of understanding. Moreover, it should indicate a logical connection with the task, making the feedback meaningful to pupils (Akkuzu, 2014; Kaplan & Assor, 2012; Uden et al., 2014). Harris and Bourne (2017) found that a lack of regular practice, lack of tutoring, and an inability to understand or carry concepts forward comprise some of the issues that render it especially difficult to understand mathematics. However, the use of colour response cards enables pupils to receive regular feedback from their teachers, enabling them to follow the concepts being taught. This can then increase their interest in the subject and reduce their anxiety, as observed by Lee et al. (2018).

In the present study, all the teachers agreed that pupils' use of colour response cards in the classroom had benefits for teachers. In particular, these cards helped with the management of and preparation (preparing teaching materials and adopting a relevant teaching strategy) for the class. As identified from the findings reported in Chapter Four (see Subsections 4.2.2, p.149, and 4.2.3, p.156), the use of colour response cards could reduce disruptive behaviour and increase pupils' academic engagement in classroom learning. This is supported by the findings of Hirsch et al. (2018), who demonstrated that colour response cards can enable active engagement in pupils' learning, where they ask their teacher questions and spend time on learning activities. In this regard, the colour response card strategy was not only seen to assist pupils, but also, to help teachers manage the classroom. This is evident from the increased academic engagement and reduced disruptive behaviour among most of the pupils as well as an increase in teacher-pupil interaction over the course of the study. Accordingly, the use of colour response cards allows teachers more time to focus on their pupils, enabling them to assess their understanding of the subject being taught. Furthermore, the use of the cards supports pupils in overcoming distress or distraction, while at the same time providing emotional support. Ensuring the implementation of such assessment practices could have a positive effect on the outcomes of an active learning technique, such as the use of colour response cards, because teaching is not only dedicated to teaching facts, but also, to developing positive relationships between pupils and teachers, improving the classroom learning environment, and promoting intrinsic motivation among pupils.

The results presented in Chapter Four (see Subsection 4.2.6, p.166) in response to RQ3 are discussed from three perspectives, which are outlined below. Firstly, based on the participating teachers' observations and experience of the use of colour response cards, their opinions of the positive effect of these cards on pupils revealed multiple benefits, such as increased motivation, greater teacher-pupil interaction, and active engagement in learning activities. Additionally, an impact of colour response card usage was identified as reducing disruptive behaviour and increasing academic engagement, based on the statistical analysis of observational data. It was reported that the pupils' motivation to learn when using the cards had greatly improved and that they were more disciplined than previously.

Similarly, the interview findings revealed that motivation and discipline were enhanced among the pupils after the intervention. Two of the three teachers stated that the use of colour response cards had greatly increased their pupils' attention, thereby reflecting the positive engagement of pupils in learning. Other studies (Alhalabi & Alhalabi, 2017; Heward et al., 1996) have elicited similar results, highlighting how colour response cards are effective in gaining pupils' attention, consequently leading to the adoption of positive behaviour and enhanced academic engagement. Simmons and Smith (2015) and Twyman (2018) found that response cards can increase motivation among pupils and raise their level of participation.

In addition to increased attention, the participating teachers observed improved performance among the pupils. One prevalent issue in the classroom is disruptive behaviour, which distracts the teacher from classroom instruction and other pupils from learning. Several previous studies (Bittinger, 2015; Duchaine et al., 2018; Pellowe et al., 2015; Twyman, 2018) have found that using colour response cards can be enjoyable for pupils, with the consequence that their attention and interest in learning is enhanced.

In the qualitative interviews, it was reported that the use of colour response cards helped the teachers to distinguish between academically weak and strong pupils, which is an important finding for Saudi Arabia, given the identified challenge of improving pupils' performance in that context (Borg & Alshumaimeri, 2012). Identifying weak pupils, or pupils who are disruptive and do not adhere to classroom instructions, and ensuring that they receive proper care and support in their learning, is one way of addressing this issue. Some researchers (Duchaine et al., 2011; Heward et al., 1996) have discerned that by enhancing learning behaviour and active engagement, pupils' performance may be increased by adopting colour response cards in the classroom. In addition, the teachers reported that whilst the colour

response card approach had proved to be effective, they had not used it previously; instead, they had relied on traditional classroom observation.

As noted by the researcher during this study (in classroom observations), the monitoring of pupils without colour response cards (as in the control groups) was found to be challenging by the teachers, because it not only affected their teaching, but also, impaired their focus in the control groups. In particular, the control group teachers were required to take extra time to observe pupils who were disturbing the rest of the class, not following the lesson, or not being attentive. In contrast, the colour response cards helped the other teachers make a quick assessment by asking questions and receiving instant responses, reflecting an active learning approach. Thus, it saved the teachers time that would normally have been required to assess pupils' understanding of the lesson content. Conversely, one teacher (Amal) mentioned that it took extra time for her to implement the colour response cards in class. As the observation was only conducted for a relatively short period, it may have been difficult for her to adopt the new strategy within the limited timeframe. However, the evidence suggests that continuous use of colour response cards can help with task management and improve teaching strategy.

Other studies (George, 2010; Munro et al., 2009) have generated similar results for the use of response cards and their impact on pupils' performance. Nevertheless, these studies have been limited to gathering academic scores to analyse performance. Using qualitative semi-structured interviews with the participating teachers in this study led to the identification of various performance metrics, based on the teachers' observations. In particular, the pupils' approach to learning (taking the form of observed classroom engagement), collaboration, and other related activities were monitored. Also, the pupils' engagement in various learning activities was observed as increasing with the use of colour response cards. Moreover, the teachers felt that the cards helped them disseminate classroom lessons with greater focus and more control, which not only saved time in their classroom teaching, but also, helped them to manage their classrooms more effectively.

The findings suggest that the pupils developed positive attitudes towards colour response cards, as they continued using them in the longer term, resulting in improved academic engagement. Based on the literature related to pupils' attitudes, it is evident from prior studies (Capel et al., 2016; Kubiatko et al., 2017; Merisuo-Storm, 2007; Rahman & Puteh, 2016) that pupils' attitudes and abilities (see Subsection 2.5.1., Chapter Two, pp.32-35) are important factors to consider in the process of classroom management. As identified from an analysis of

the teachers' perceptions in this study (see Subsection 4.2.6, p.166), the pupils held positive perceptions of colour response cards and were motivated by them, potentially leading to intrinsic motivation for learning (Ferreira et al., 2011) as well as greater autonomy and self-motivation in that learning.

The findings in this present study support the literature and theories related to the classroom environment (De Giuli et al., 2012; Golley et al., 2010; Mooij, 1998; Mooij & Smeets, 2009; Wenhan, 2019), as the colour response cards were identified as motivating and supportive of pupils' learning. Meanwhile, the teacher's role (Clarke & Visser, 2017; Duesund & Odegard, 2018; Kambuga, 2017; Rae et al., 2017) was supported by using the cards to assess pupils, being able to concentrate on their queries, and delivering classroom instruction, accordingly. Pedagogical/teaching strategies (Granero-Gallegos et al., 2019; Hickey et al., 2015; McGrath et al., 2017) were successfully adopted, where the colour response cards improved the teacher-pupil relationship. This enabled the teachers to better understand their pupils' attitudes and behaviour patterns, in accordance with which they adapted their teaching strategies. These factors have been identified as influencing pupils' behaviour. Moreover, the teacher's role in understanding pupils' basic psychological needs, as discussed in the Literature Review (Subsection 2.5.3, Chapter Two, pp.38-41), is shaped by their competencies, attitudes, and perceptions of classroom management, as well as by pupils' disruptive behaviour. Some of these aspects identified in this study, such as teaching approaches, feedback, and interaction between pupils and teachers (using colour response cards), have been found to help teachers gain a better understanding of pupils' needs and how to deal with classroom behaviour.

Pupil engagement is a psychosocial process resulting from an interaction between an individual and contextual factors (Fredricks et al., 2004). These positive relationships can be linked with relatedness, which is one of the main elements considered in Basic Psychological Needs Theory (BPNT). In particular, the classroom environment (Guardino & Antia, 2012) and school characteristics can help create positive experiences of school for pupils (Moreira et al., 2014; Moreira et al., 2015; NRCIM, 2004; Wang & Eccles, 2012a, 2013).

The findings demonstrate that colour response cards are easy for both teachers and pupils to use in the classroom. Their usage by teachers in the intervention classes (on average, 6-7 times per class) demonstrated the normal use of colour response cards to ask a question and receive an answer from pupils, which saved time in assessing the pupils. For instance, if colour response cards were not used, teachers could have taken more time to answer queries raised by

individual pupils, and ultimately, they might not have been able to assess the whole class to check whether the pupils had understood the instructions. If colour response cards were used, teachers could ask pupils if they had followed a particular concept at different points in the lesson, and could address pupils' queries at the same time, thereby saving time in providing feedback and assessing them. This benefit was identified in the interview finding as facilitating prompt decision-making by the teachers and clearing up pupils' doubts effectively. If the teachers had not received proper responses by implementing the colour response cards, or if the pupils had found the cards difficult to use, neither side would have used them or presented them with any frequency. Therefore, it may be concluded that colour response cards are easy to implement and effective for engaging pupils in learning.

According to the interview findings (see Subsection 4.2.6.1.3, p.171), the colour response cards were beneficial for improving pupils' self-confidence, in that they elicited constructive feedback from the teachers. In this context, teachers' feedback, as identified in the Literature Review, is an important element in improving pupils' self-evaluation and confidence to engage in learning and academic tasks (Hattie & Timperley, 2007). Here, the present study findings could further reinforce the applicability of colour response cards as a comparatively low-cost and easy-to-use intervention, specifically identified in the teachers' interview findings. Moreover, the cards may be more effective than the tools adopted in traditional models of intervention. Bittinger (2015) and Duchaine et al. (2018) determined that response cards were effective for reducing disruptive behaviour and improving academic performance, in contrast to traditional approaches, such as hand-raising. This is evidence of the effectiveness of colour response cards over other low-cost (Heward 1994; Horn 2010) and easy to implement interventions.

Low cost and ease of implementation were the two main criteria considered in identifying colour response cards as the appropriate intervention technique. It is evident from the results that with minimal cost and without affecting other teaching methods in the school system, pupils' classroom behaviour can be managed. Whilst some studies have focused on using game-based learning (Przybylski & Mishkin, 2016) and response card systems (Aggarwal, 2018; Stowell & Nelson, 2007), which resemble the colour response card approach, these require high investment, additional training, and are complex to implement. In contrast, basic colour response cards do not entail substantial investment or cost and are not complex to implement.

Additionally, colour response cards have been identified as just as effective as high-cost interventions (Aggarwal, 2018; Przybylski & Mishkin, 2016; Stowell & Nelson, 2007), with regard to reducing disruptive behaviour and increasing academic engagement. Hence, they may be considered as an especially practical strategy for managing academic engagement and disruptive behaviour, exceeding the benefits of other response card systems (Aggarwal, 2018; Duchaine et al., 2018; Lambert et al., 2006; Paulish, 2018; Stowell & Nelson, 2007) or game-based learning (Lynch & Keenan, 2018; Rubow et al., 2018), which are regarded as high-cost interventions. It is evident from the study that the implementation of colour response cards in the schools was conducted at low cost, without requiring any additional equipment, except for the cards and badges for the pupils. Existing classrooms were used for the intervention, thus incurring no additional costs.

In contrast to the abovementioned approaches in the literature, a few other studies in which a similar approach is proposed have included a low-cost intervention or offered equivalent ease of use. By way of example, Lynch and Keenan (2018) and Rubow et al. (2018) analysed the Good Behaviour Game, which involves dividing a class into groups and arranging a competition between them to exhibit good behaviour, whereupon those who perform well are rewarded. Whilst this intervention is easy to implement, with little effort and at low cost, its focus is on pupils' behavioural change (change in disruptive behaviour). Hence, the learning process (academic engagement) in this intervention has been identified as receiving less priority (Rubow et al., 2018). In contrast, this current study and its use of colour response cards was focused equally on enhancing academic engagement (learning, participation, responding) and reducing disruptive behaviour.

Feedback is considered as an important component of the learning process in that it can be affective in enhancing pupils' engagement. If pupils do not understand the feedback, it might not be possible for them to engage further in the lesson or concept being taught. Therefore, feedback needs to correspond to the pupils' level of understanding, which should indicate logical connections with the task as well as being clear and meaningful (Akkuzu, 2014; Kaplan & Assor, 2012; Uden et al., 2014). The teachers also mentioned that the cards not only enabled them to give feedback to the whole class, for they also enabled them to provide effective feedback to individuals and small groups of pupils. For instance, it was identified in the interview analysis that the teachers grouped pupils holding up the same cards (for example, the red cards) and addressed their questions collectively. This approach can save classroom time in clearing up the pupils' queries and engaging them in learning.

In short, the cards helped the teachers to observe and assess their pupils in a simplified way, which they were not previously able to achieve via other methods. With the feedback gathered from the pupils, the teachers were able to address any doubts and respond to questions in a timely manner, which fostered the pupils' active engagement. The interview data suggest that the cards were seen as fun and stress-free, thereby having a positive impact on the pupils in terms of increasing their attention, improving their performance, enhancing their motivation, and bolstering their self-confidence. Moreover, shy pupils were actively engaged in answering the questions using the colour response cards, which reflected in improved academic engagement and increased confidence. Similar results have been observed in other studies (Bittinger, 2015; Duchaine et al., 2018; Hattie & Timperley, 2007; Pellowe et al., 2015; Twyman, 2018), where it was demonstrated that response cards could be fun to use. Consequently, pupil engagement in learning is increased, whilst also improving pupils' self-esteem and confidence. The findings suggest that fun and enjoyment were a few of the aspects highlighted as important and even essential elements of the learning process.

The second perspective related to RQ3 and its focus on the observations and experience (assessed from the interviews) of the participating teachers, regarding the use of colour response cards. The findings revealed multiple benefits associated with using these cards for classroom management and pupil assessment (identifying pupils with high disruptive behaviour and low academic engagement), which helped the teachers develop additional strategies, such as group-based learning in line with their pupils' behaviour. This approach enabled the teachers to gain more control over their classes and lesson delivery. It also helped them in assessing their pupils more effectively. As identified in the interviews, this immediate success in managing the class could also help teachers plan the use of colour response cards as long-term strategies for classroom management (see Subsection 4.2.6.2.1, pp.172-174). These findings corroborate with the SDT perspective that managing behaviour contributes to a well-structured and an orderly teaching and learning environment (Skinner & Belmont, 1993).

In a similar context, Khan (2015) concluded that response cards helped teachers control disruptive behaviour in the classroom by turning pupils' attention towards learning, with similar results – such as increased instructional time with reduced disruptive behaviour (Christene et al., 2019), and the use of gestures to enhance pupils' attention (Frondeville, 2009). However, it is possible that the teachers' confidence not only impacted on the pupils' learning engagement, but also, influenced their own self-development, views on learning, self-evaluation, etc. It was gathered from the review of the literature that positive attitudes lead to

a sense of pride, satisfaction, and motivation. The findings revealed that the teachers were happier and more confident about teaching than they were before using the cards (see Subsection 4.2.6.2.3, p.175). In particular, they were able to manage their classes more effectively, with less disruptive behaviour and increased academic engagement, leading to a sense of satisfaction and ease among the teachers. They reported that they were able to focus more on implementing effective teaching strategies to promote learning, rather than having to invest extensive effort into managing challenging behaviour. This could then manifest in improved academic engagement, as demonstrated in high exam scores and a sense of introjection, with pupils feeling that they should engage in academic subject matter (Vansteenkiste et al., 2010). Moreover, the confidence that a teacher might experience could in fact increase their motivation to improve their teaching strategies and manage their work more effectively and efficiently. The results in this study reveal that the teachers found the colour response cards useful for managing their classes.

As identified from the (interview) findings, the teachers responded that they were now able to assess their pupils more effectively and develop new teaching and learning strategies, according to their pupils' needs (as they were actively engaged). This facilitated an effective and efficient decision-making process among the teachers. Accordingly, the evidence suggests that using colour response cards can also help teachers adjust their instructions and decisions to pupils' needs (Dawn, 2008; Munro et al., 2009).

Nevertheless, the interview findings suggest that the teachers perceived successful learning to be the satisfactory performance of academic tasks. The interviews also raised some issues that were not really linked to colour response card use, but more generally to the way in which the teachers judged their pupils' learning. For instance, the completion of academic tasks does not necessarily equate with progress and learning. That is, teachers should understand that the use of response cards could ensure progress in the long term. This point should be clarified to teachers to inform their future use of such cards.

The third perspective in relation to RQ3 relates to the observations and experience of the participating teachers, with regard to using colour response cards. Their opinions about using these cards in future reflected potential growth in their usage (see Subsection 4.2.6.3, pp 176-177). Given this positive view, the teachers also declared that they would share this approach with their colleagues in future. The potential benefits of colour response cards in the classroom have been analysed in relation to various subjects and across academic environments (Alhalabi

& Alhalabi, 2017; Bondy & Tincani, 2018; Cassel, 2016; Gardner et al., 1994; George, 2010; Munro et al., 2009; Rangvid, 2016; Wang, 2016). Accordingly, the participating teachers stated that they would use the cards for other subjects and with different pupils in future, also recommending other teachers to do so. That is, given the results of colour response cards in decreasing disruptive behaviour and increasing academic engagement, it may well be beneficial to apply them in wider contexts and with other subjects. Pre-printed response cards have been utilised at pre-school level to improve pupils' engagement in colouring and calendar activities (Godfrey et al., 2003; Inwood, 1995), as well as in primary school classrooms to improve pupils' behaviour during science (Gardner et al., 1994), mathematics (Armendariz & Umbriet, 1999), vocabulary (Munro & Stephenson, 2009), and social studies (Narayan et al., 1990) lessons. Accordingly, this current research identified that colour response cards could be effective in increasing pupils' interest and engagement in studying complex subjects, such as mathematics.

The researcher met with the teachers during all three stages of this current study, providing feedback, additional coaching and support in implementing colour response cards in the classroom. This additional support for teachers could have been the reason for the high implementation fidelity observed with all three teachers. As discussed earlier, the teachers identified that this approach could be beneficial for other subject teachers, as it was effective and easy for them to implement. For instance, the issues observed by Muna (Teacher Three) could refer to any classroom and are not subject-specific. These are general observations of how pupils adopt disruptive behaviour from their peers, or how less attentive ones may disengage from classroom learning. Therefore, sharing the benefits of colour response cards with other teachers could encourage them to apply the cards and increase their pupils' engagement.

It should be noted that all three datasets are consistent, including the observations of changes in pupils' academic engagement and disruptive behaviour, the pupils' perceptions of using colour response cards as well as the teachers' perceptions of using the cards and their impact on their decision-making. The pupils' positive perceptions of the cards, as revealed in Section 5.3, can be linked with improved academic engagement and reduced disruptive behaviour, as identified in Section 5.2. Similarly, the teachers' positive perceptions of colour response cards, as reported in Section 5.4, and the appropriate (frequency of) use of them cards in the classroom, may be correlated with pupils' interest in using the cards (see Section 5.3),

and changes in their behaviour and engagement (disruptive behaviour and academic engagement), as identified in Section 5.2.

5.5. Chapter Summary

Based on the discussion of the findings (improvement in academic engagement and reduced disruptive behaviour of pupils in the intervention groups, compared to the control groups), it may be concluded that the use of colour response cards can improve academic engagement and reduce pupils' disruptive behaviour. The pupils found the cards easy to use, and they offered the teachers an opportunity to enhance their decision-making in assessing feedback from their pupils, as well as the capacity to develop new strategies for effectively assessing their pupils' learning progress, behaviour, and abilities. In general, both the teachers and pupils showed complete adherence to the colour response card approach by the end of the intervention, thereby suggesting that the technique was effectively embedded as a routine in their teaching and learning. Thus, teachers could improve their teaching practice by implementing colour response cards in their regular classrooms, as this tool is easy to understand and implement. In addition, the use of the cards was found to have a positive impact on both pupils and teachers: it helped the teachers develop their capabilities as educators by focusing more on constructive teaching strategies, rather than being distracted from their teaching by having to attend to the disruptive behaviour of specific pupils. In addition, the use of colour response cards simplified the process of assessing pupils, whereby the teachers were able to evaluate their pupils' understanding and engagement during lessons. This facilitated the teachers' responses to their pupils' queries, as they were able to provide instant feedback, whilst also assessing the whole class within a short time period.

In this chapter, the three research questions posed in Chapter Two were addressed by analysing the gathered data. The next chapter will now conclude the study, considering its limitations, practical and theoretical implications as well as making suggestions for future research in this area.

CHAPTER SIX: CONCLUSION

6.1. Introduction

This chapter considers whether the aim and objectives have been met, based on the study findings, and whether the research questions have been fully addressed. In addition, the research contributions to the literature and practice; research limitations; and proposals for future research are presented. The aim of this study was to investigate the impact of using colour response cards on pupils' academic engagement and disruptive behaviour in primary schools in Saudi Arabia. Moreover, it looked at the ways in which the cards impact on teachers' decision-making in relation to classroom management and teaching. It subsequently emerged that the use of colour response cards can reduce disruptive behaviour and improve academic engagement among primary school pupils. In addition, the use of the cards was found to facilitate teachers' decision-making, in that the teachers could easily ascertain whether the pupils had understood the lesson; identify those who had doubts; monitor pupils; and hence, manage the classroom more effectively. Data collection methods, including classroom observations, a survey, and semi-structured interviews, were implemented to collect the relevant information. The quantitative data collected through observations and the survey were analysed using statistical techniques including two-way ANOVAs. The findings relating to each research question are summarised in the following sections.

6.2. RQ1: How Do Colour Response Cards Influence Pupils' Academic Engagement and Disruptive Behaviour in Saudi Mainstream Schools?

The classroom observations made by the researcher and two co-observers were used to analyse the changes in the pupils' disruptive behaviour and academic engagement. The observations were identified as reliable, because there was consistency achieved in those conducted by the researcher and two co-observers. The collected data in the observation checklists were analysed using two-way ANOVA, from which satisfactory results were obtained in the intervention groups, compared to the control groups in the two schools. The mean disruptive behaviour was reduced throughout the intervention: pre-intervention ($M= .30$), introduction ($M= .19$), and established ($M= .17$) conditions. In contrast, the mean disruptive behaviour in the control groups was slightly increased throughout the study: pre-intervention ($M= .48$), introduction ($M= .55$), and established ($M= .57$) conditions. Hence, it was concluded that colour response card usage can reduce disruptive behaviour among primary school pupils. Similarly, results

emerged for the intervention groups in relation to academic engagement. Their mean scores increased during the intervention, but were slightly reduced afterwards: pre-intervention ($M=.69$), introduction ($M=.80$), and established ($M=.73$) conditions. However, the mean scores for academic engagement in the control group were reduced during the study, but slightly increased by the end: pre-intervention ($M=.61$), introduction ($M=.41$), and established ($M=.45$) conditions. Thus, it may be concluded that the use of colour response cards can improve academic engagement among pupils in primary schools. However, there were slight differences in the findings relating to disruptive behaviour in School A and School B. While a few pupils in School A were observed to exhibit a slight increase in disruptive behaviour after the intervention, none in School B displayed such a change. However, the slight increase in disruptive behaviour after the intervention in School A was comparatively much less than the disruptive behaviour revealed before the intervention. These minor differences are likely to be attributable to differences in the setting and influencing factors, such as pupils' attitudes, the teacher' role, school/classroom environment, and pedagogical/teaching strategies. Regarding the frequency of their usage, improvements in academic engagement and reduction in disruptive behaviour, and pupils and teachers' perceptions of using colour response cards, it may be concluded that the use of these cards is an effective intervention, which is easy to implement for the purpose of reducing disruptive behaviour and increasing academic engagement in the context of Saudi primary schools.

6.3. RQ2: What Are Pupils' Views of Using Colour Response Cards?

A total of 101 pupils from the three intervention classes (two in School A, one in School B) participated in the survey, which was used to ascertain their perceptions of using colour response cards. The pupils' mean rating across the three classes for the statement that the colour response cards had helped them in their learning ranged from 1.82-2.12 (1=Strongly agree; 5=Strongly disagree), thereby indicating that the majority perceived these cards to be effective in helping them in their learning. Focusing on the classroom behaviour, most of the pupils (mean rating 1.85-2.31) perceived that the colour response cards had helped them remain quiet and listen to the teacher. These ratings indicate that the colour response cards were effective in managing pupil behaviour in the classroom. With regard to engagement, the majority of the pupils (mean rating 1.91-2.18) agreed that their usage had helped them follow the teacher during lessons. Moreover, colour response cards were found to be effective in improving academic engagement and reducing disruptive behaviour by encouraging pupils to cooperate

with peers to promote their learning (mean rating 2.03-2.51). In addition, no major differences in the opinions of the pupils in the three groups were identified, consequently indicating consistency in their opinions. However, in a few instances, colour response cards were identified as less effective in reducing disruptive behaviour in the established conditions (Pupils 3, 4, 5, 6 in the Apple Group; Pupils 2, 5 in the Cherry Group) and similarly, in improving academic engagement (Pupils 3, 4, 5, 6, 7 in the Apple Group; Pupils 2, 4, 5 in the Cherry Group; Pupil 4 in the Grape Group). Therefore, it would appear that whilst colour response cards can have a positive impact on improving academic engagement and reducing disruptive behaviour in the majority of pupils, their impact may be limited in the case of a few.

Hence, it can be concluded that the pupils' perceptions of colour response cards confirm the positive impact of these cards on the pupils' learning engagement, cooperation with peers, and willingness to involve themselves in lessons by interacting with teachers in the classroom. Given the pupils' positive perceptions of the use of the cards, in terms of their impact on increasing academic engagement and decreasing disruptive behaviour (as explained in the previous section), use of these cards may be considered as an effective approach for primary schools, especially in Saudi Arabia, where class sizes are usually large.

6.4. RQ3: What Are Teachers' Perceptions of Using Colour Response Cards in the Classroom and How Does This Use Affect Their Classroom Management and Assessment Practices?

Semi-structured interviews were conducted with three teachers from School A and School B to collect data relating to their perceptions of using colour response cards and how this had affected their decision-making. It was reported that the pupils' attention had improved pointedly, and they were motivated to participate in classroom learning. According to the teachers' interview responses, some of the pupils who were identified with disruptive behaviour before the intervention became more active in responding to the teachers' questions and actively engaging in the lessons. In addition, the increased participation of other pupils was observed in classes at both schools. As a result, the pupils' academic engagement in the intervention classes improved considerably, which led to reduced disruptive behaviour as the pupils became more disciplined (behavioural engagement). A lack of discipline was an important aspect identified in relation to disruptive behaviour. It was anticipated that colour response cards could address this issue by engaging the pupils in a series of activities (questioning and answering) that would enhance the active learning process. Moreover,

adopting an effective and systematic way of learning using the cards could engender a sense of discipline in the classroom. Continued use of the cards could further improve their self-engagement.

With the use of colour response cards, a gradual improvement in the pupils' performance was observed, which could be attributed to their increased engagement in the learning and their cooperation with peers and teachers in the learning process (emotional engagement). The use of them led to increased motivation, self-confidence, and self-assessment practices among the pupils, these pertaining to cognitive engagement. In addition, the colour response cards were considered to be fun, such that the pupils enjoyed using them, thus making them easy to implement. It would seem that this is especially the case in primary schools. Thus, the findings indicate that the use of colour response cards could lead to pupils' cognitive, behavioural, and emotional engagement.

Regarding the impact on teachers and their decision-making, it was elicited that the colour response cards were very helpful for managing classes. The teachers had more control over them, as they were able to assess the class as a whole. Moreover, they were able to give feedback to individual pupils while they were teaching. Their usage enabled them to organise their teaching materials and strategies more effectively, thus leading to more effective and efficient decision-making in relation to their teaching. In addition, the pupils' increased engagement and reduced disruptive behaviour made it easier to manage their classes. As a result, the teachers were more comfortable in the classroom.

All the teachers who participated in the interviews said that they would share the benefits of using colour response cards with their colleagues, including those who taught subjects other than mathematics. Consequently, it may be concluded that colour response cards can enable teachers to make more effective decisions about their classroom management and teaching. It should be noted that this card strategy was mainly focused on pupils' interaction with their teachers, rather than pupils' interaction with peers. Hence, it may be considered as an effective pupil-teacher strategy. However, it should be clarified here that colour response cards indirectly facilitated pupil-pupil interaction, where the teacher arranged group discussion or group assignments, based on the feedback provided by the pupils using the cards.

The findings support the theoretical assumptions adopted in this study. Relatedness, autonomy, and competence (the three main factors of Basic Psychological Needs Theory BPNT) were identified. The relationship between pupils and teachers was found to be

supportive and interactive when colour response cards were used. This led to the pupils having greater control over the learning process, in that they were able to ask questions (autonomy) and had greater engagement in their own learning (competence). Assessment and feedback contributed to the development of pupils' competence and engagement in learning, thereby decreasing their disruptive behaviour. The use of colour response cards would appear to resonate with Causality Orientations Theory (COT), according to which an individual's motivation and beliefs can promote change in behavioural patterns. In addition, the pupils were extrinsically motivated by rewards or appreciation from their teachers, which led to intrinsic motivation, which appears to resonate with Cognitive Evaluation Theory (CET). However, external factors, such as responsibility and accountability, can be less supportive of autonomy, and teachers cannot adopt teaching strategies independently.

To summarise, the use of colour response cards as a strategy for improving academic engagement and reducing disruptive behaviour can be effective and efficient, if the influence of external factors (curriculum changes, work burden, classroom environment, etc.) is reduced. In addition, the use of such cards can enable the effective management of the classroom, and increase interest and engagement in learning among pupils, leading to their intrinsic motivation. In this study, this has been shown to result in changes in disruptive behaviour and improved academic engagement. Thus, SDT was supported by the present study findings, which revealed that a colour response card intervention can produce intrinsic motivation among pupils, thereby leading to changes in behavioural patterns, such as improved academic engagement and reduced disruptive behaviour.

From the concluding remarks in the previous three sections, it can be concluded that this study has addressed the three research questions (Section 2.9) and objectives (Section 1.5), explained in Chapter One. In addition, the findings supported SDT and its relevant sub-theories, including COT, CET, OIT, and BPNT in the context of using colour response cards for improving academic engagement and reducing disruptive behaviour.

6.5. Research Limitations

This study involved investigating the impact of using colour response cards as an active learning approach to managing disruptive behaviour and academic engagement among pupils in primary schools in Saudi Arabia. However, limitations have been identified in this investigation, which could form the basis for future research. These include the following:

- For this study, disruptive behaviour and academic engagement during one instructional time period only was examined. It would be interesting to collect additional data simultaneously during a non-target instructional time period, in order to determine whether teachers could implement the colour response card intervention independently, without consultation support, and whether this would result in improved pupil behaviour and academic performance during the non-target instructional time.
- The data were collected at three time points: pre-intervention, intervention, and established conditions. Collecting data at different time intervals on multiple occasions could lead to changes in disruptive behaviour and academic engagement being identified more accurately.
- Only a relatively small sample was utilised for the data collection, including 101 pupils in three intervention classes, and 18 pupils in control group classes, taught by three teachers from two primary schools. It would, therefore, be beneficial to apply the approach to a larger population or region by including varying samples from different primary schools in different regions, and pupils with different abilities. This would allow for the results to be generalised across a wider population, so that deeper insights into the impact of colour response cards on both teachers and pupils could be gained, which is not possible with the outcomes of the current research. Furthermore, pupils' parents' socio-economic conditions were not considered in this study, and they may have an impact on pupils' academic engagement and disruptive behaviour.
- Another limitation is that all the participants in this study were female, because the two primary schools selected were girls' schools. Identifying the impact of colour response cards on academic engagement and disruptive behaviour according to gender would further contribute to the literature, especially given the well-documented distinctive behaviours of boys and girls in the classroom.
- This study involved only investigating the impact of colour response cards on pupils and teachers who were teaching and learning mathematics. Analysing their influence in relation to a range of primary school subjects could, therefore, help determine the applicability of the cards across different disciplines.
- The teachers did not complete the journals as desired. That is, the content of two of the teachers' journals (see Appendix C) was limited after each intervention. Those two

teachers pointed out that they were overloaded with work and teaching obligations. Consequently, they were unable to give much time to the journal entries.

- Another limitation of this study is that it was solely focused on primary school pupils. Hence, such an enquiry should be extended to include those studying at intermediate and high schools.
- Due to time constraints, the control group did not receive the intervention as the schools were not able to accommodate this. However, the positive interest shown by the teachers provides the potential for it to be applied by others in the future.
- The control group showed rather more disruptive behaviour before the intervention, compared to the intervention group. Ideally, the control group would have had a similar level of disruptive behaviour (and academic engagement) at the beginning of the study. These differences may be due to the pupils' prior levels of disruptive behaviour and academic engagement.
- Finally, this study did not consider other influencing factors, such as the school environment, parental support, peer support, etc. alongside the colour response card intervention. Hence, future research should integrate the use of colour response cards with further influencing factors (considering the age group of pupils in primary schools, who require more attention) that could affect pupils' behaviour and engagement. The style of schooling and other factors, such as class size may be high influencing factors in Saudi Arabia. As it is not possible to devise interventions focusing on all influencing factors, the scope of the study was limited to a teaching intervention (active learning: colour response cards).

6.6. Contributions to Knowledge and the Literature

This study has contributed to the existing literature on the use of colour response cards for managing academic engagement and disruptive behaviour. To the best of the researcher's knowledge, no prior research has investigated the impact of these cards on pupils in real classroom settings, using observations in the Saudi context, whilst also assessing pupils and teachers' perceptions of using this tool. Most of the previous research studies have been focused on using response cards as assessment and engagement techniques, but very few have considered colour response cards for managing academic engagement and disruptive behaviour. This study addresses these research gaps and provides academia with valuable knowledge in this context. The findings from this study could be used by researchers to enhance

their studies in similar contexts when designing their research (impact of colour response cards on pupils/teachers, etc.).

Various approaches can be identified, with regard to actively engaging pupils in learning, thereby reducing their challenging behaviour. However, no studies to date have investigated the impact of colour response cards on primary school pupils, which was one of the main research gaps identified. Given the issues associated with primary schools in Saudi Arabia, such as large class sizes, high levels of disruptive behaviour, and poor academic engagement, there is a need for further research in this area, aimed at delivering effective solutions, possibly in the form of a framework for managing the identified issues more effectively. Thus far, no such work has been undertaken in relation to Saudi Arabia. Hence, this is one of the main research gaps that still needs to be addressed. In addition, most of the relevant studies (see Chapter Two, Section 2.2) have adopted a single methodology using a single instrument, such as a questionnaire or observation, with few using multi-methods (observation and questionnaire), thereby limiting the potential to collect different types of information from different perspectives (teachers, pupils).

Change in behavioural patterns requires interpretative approaches and the adoption of qualitative techniques. Qualitative techniques such as interviews, enable researchers to interpret changes in behavioural patterns and the impact of interventions in detail, while quantitative methods, such as surveys, can support findings with scientific and statistical results. Considering these factors, for this study, multiple methods were adopted for data collection, including observations, a survey, and semi-structured interviews to enhance the robustness of data that were collected and analysed.

6.7. Contributions to Practice

The findings from this study can be used by teachers and school managers to develop strategies for managing disruptive behaviour and academic engagement. That is, teachers could use colour response cards as a technique for reducing disruptive behaviour and increasing academic engagement. The cards could be integrated with other active learning techniques to manage whole class activities, assessing the pupils' progress and engagement as well as enhancing their decision-making. In so doing, teachers could better organise their teaching strategies and other additional work, which would reduce issues relating to managing classes and thus, increase

their job satisfaction. In addition, the school management could integrate colour response cards with other active learning strategies in the school curriculum.

Furthermore, this practice could be extended across primary, intermediate, and high schools. Based on the experiences identified from the teachers' interviews, where they felt that they had more control over the class than before, it could be recommended that colour response cards can be implemented as a whole school approach. Colour response cards can also be included in teacher training programmes and the curriculum for pre-service teachers. It can help teachers and pupils to adopt simple and easy to learn interventions, which are still as effective as more complicated and costly ones.

6.8. Personal Reflections

As a researcher, I discovered that I was dealing with the so-called 'impostor phenomenon' after my graduation, or the tendency to doubt my intellectual capacity. Whilst my colleagues and friends often reminded me of my achievements, stressing my potential to become a researcher, I did not believe them. However, I decided to rely on self-motivation and the management of my feelings in dealing with imposter phenomenon, starting to focus on the facts, addressing my limitations, identifying my strengths, and setting goals. I began celebrating small victories, such as writing articles, accepting new challenges, seeking to improve my literature research skills, and spending more time with people who frequently reminded me of my strengths. Whilst it took some time to plateau, after practising this for five months, I felt more confident about undertaking a Ph.D. I went on to learn many other things during my Ph.D., which improved my competence, both in theory and practice. Being a Saudi citizen and at a personal level experiencing the problem of disruptive behaviour and poor academic engagement among pupils in Saudi schools, I carried out my initial research in this area. I observed that the issues relating to disruptive behaviour and poor academic engagement were more prevalent in a Saudi public-sector school, and the lack of effective and feasible strategies for managing these issues attracted my attention, thereby forming the foundation of my Ph.D. research.

Out of the many things I gained through completing my Ph.D. was greater awareness of theory and practice. My first challenge was to conduct an extensive literature search to identify the gaps and best approaches for the context of Saudi schools in managing disruptive behaviour and poor academic engagement. With support from my supervisors and teachers, I improved my skills in this area: literature searching to identify the relevant papers and other material for

inclusion in the literature review. Writing the literature review improved my critical thinking and analytical skills, in that I can now critically evaluate findings and statements from different studies. Moreover, field research (observations, surveys, interviews) was highly challenging for me, as I had never been exposed to it before; I had no prior knowledge or experience of this kind of activity. However, reading the previous literature and considering feedback and suggestions from supervisors helped me to overcome this challenge. As a result, my communication skills were reinforced and I became more confident in discussing points with teachers and other staff, without any hesitation or fear. In particular, I was aware of the ethical considerations surrounding my study and realised that it was essential to explain to the participants and other stakeholders, including the pupils' parents and headteachers, the study aim, intervention process, and purpose of the interviews. Additionally, I ensured the confidentiality and privacy of the participants by maintaining their anonymity.

During this journey, I have experienced imposter syndrome. Surrounded with lots of information about different concepts, I was wondering if I were able enough to carry out a Ph.D. study. Collecting and reviewing exhaustive literature was overwhelming at times, making me anxious due to the fear of missing out on a specific article that I may not have come across. This continued until one of my friends said, "you are simply becoming more aware of what you don't know".

The data collection and analysis process increased my knowledge and awareness of various academic and research processes, including compiling a literature review, planning and implementation, setting milestones and achieving them, data collection and analysis, and undertaking field work. Not many people get to this point of learning so much information, but kudos to me for taking a step on a tough path. I decided to learn as much as I could and not to worry about the knowledge that I may have missed out in acquiring. I learned that it is fine to not know everything. However, at the same it is also important to not miss out on important information. So, I adopted a strategy for finding relevant information, which improved my information searching strategy and helped me in gathering that required of relevance to my study.

Overall, during the course of the literature review and data collection activities, there have been challenging materials and opportunities that pushed me out of my comfort zone. But I embraced those opportunities and did not shy away from them. Whilst some went well, others

did not, but I did not let these situations affect my mental state. At times, it was stressful, but I tried to be brave in dealing with such situations and I succeeded in doing so.

With this new spirit, I analysed the data and completed my report. Overall, my experience of undertaking this Ph.D. enhanced my motivation and satisfaction.

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Appendix A: Observation Checklist

Disruptive behaviour and academic engagement sheet for pupil

Date:

Start time:

end time:

disruptive behaviour (DB) such as: out of seat, fidgeting, playing with objects, talking/yelling about things. Meanwhile, academic engagement (AE) such as writing, raising hands, answering questions, talking about the lesson, listening to the teacher, reading silently, or looking at instructional materials"(Fabiano et al., 2017)

Second student	45s (5s each) Time start:		15s comments		-0 5s		15s comments		-0 5s		15s comments		-0 5s		15s comments		
1	DB	AE			DB	AE			DB	AE			DB	AE			
2	DB	AE			DB	AE			DB	AE			DB	AE			
3	DB	AE			DB	AE			DB	AE			DB	AE			
4	DB	AE			DB	AE			DB	AE			DB	AE			
5	DB	AE			DB	AE			DB	AE			DB	AE			
6	DB	AE			DB	AE			DB	AE			DB	AE			
7	DB	AE			DB	AE			DB	AE			DB	AE			
8	DB	AE			DB	AE			DB	AE			DB	AE			
9	DB	AE			DB	AE			DB	AE			DB	AE			

Number of time using colour response cards:

Number of time of using CRs								
Total of using colour card:								

s student	(5s each)		comments	5s		comments									
1	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
2	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
3	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
4	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
5	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
6	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
7	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
8	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
9	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
Second s student	45s (5s each)		15s comments	-0 5s		15s comments	-0 5s		15s comments	-0 5s		15s time end	-0 5s		15s comments
1	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
2	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
3	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
4	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
5	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
6	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
7	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
8	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	
9	DB	AE		DB	AE		DB	AE		DB	AE		DB	AE	

Appendix B1: Sample Interview Questions



Indicative questions interview for teacher

- 1- Have you noticed any changes since you started using colour response cards?
- 2- How do colour response cards help you in taking decisions for teaching children?
- 3- What is the impact of using colour response cards on preparing lesson plans?
- 4-What are the advantages of using colour response cards?
- 5- What are the disadvantages of using colour response cards?
- 6- How can using colour response cards help teachers in some form of direct daily measurement to guide instructional decision-making?
- 7- Do you think using colour response cards encourage teachers to reflect on their own teaching strategies? If yes, or no, why?
- 8-Has the colour response card strategy given you an opportunity to reflect on how you view learning and behaviour? If so, please give details.
- 9- Does using response cards help you to identify pupils' level of understanding?
- 10- Would you recommend adopting the colour response card strategy to another teacher?
- 11- Overall, did you think that the colour response card intervention helped your pupils academically in the classroom?
- 12- How do the colour response cards impact on the pupils' behaviour?

Appendix B2: Coding of interview transcripts

B2.1 Rawan's Interview Transcript

Have you noticed any changes since you started using colour response cards?

Yes, the pupils looked more motivated to participate in the classroom. I observed them to be more engaged than before, and their attention towards the lessons had increased. They were mostly eager about the questions that I would ask, and that they would get a chance to respond.

How do colour response cards help you in taking decisions for teaching pupils?

The pupils became more focused and responded to me with more self-confidence and I helped pupils to arrange and master the work, and they started by making a decision before holding

up a colour card, for example, if they know the answer, they hold up the green card and if they don't know the answer, they hold up the red card. This process helped me in deciding whether or not to proceed with the next concepts during the teaching.

What is the impact of using colour response cards on preparing lesson plans?

It is a positive impact. I can better analyse the pupils on their levels of understanding. As a result, I can arrange my lesson plans in such a way that the pupils can easily understand the concepts by teaching simple and easy to understand topics at first, which can instil confidence in them, and later turn towards topics that require a little more effort.

What are the advantages of using colour response cards?

I think the colour response card approach is easy to implement. It can be applied in other subjects as well. As the concepts in all other subjects are at primary [school] level, and these are the basics that pupils need to learn and retain, I feel it is beneficial to use colour response cards in other subjects as well.

What are the disadvantages of using colour response cards?

As such, I could not identify any disadvantages, except I did not have a teaching assistant, I lost time in giving out and collecting the cards from the pupils. Moreover, pupils put them in their mouth. Some pupils did not want to answer, so they raised the red card to protect themselves and feel safe that the teacher would not ask them to answer.

How can using colour response cards help teachers with some form of direct daily measurement to guide instructional decision-making?

Maybe it does, because as I mentioned before these cards make me notice my students more than before. Therefore, their behaviour toward the lesson and how they respond I have noticed more than before. They helped me to organise my work, for example, I asked the pupils to hold up one card when I asked them questions. They responded with the green and red cards. I could easily identify the percentage of pupils who understood the concept and those who didn't. I could identify those who had raised red cards, ask them about their doubts, and was able to provide instant feedback, which not only cleared the doubts of individual pupils, but also all similar doubts among other pupils.

Do you think using colour response cards encourages teachers to reflect on their own teaching strategies? Please give reasons for your answer.

To some extent, yes, because I have noticed now the pupils are better than before and I feel happy to move on. They are happy that their doubts are cleared instantly and are more active and motivated towards learning. This change in behaviour and pupils' attitudes towards learning helped me to reflect positively on my teaching practices because of the change I noticed among the pupils.

Has the colour response card strategy given you an opportunity to reflect on how you view learning and behaviour? If so, please give details.

Maybe it does, because as I mentioned before these cards make me notice my students more than before. Therefore, their behaviour toward the lesson and how they respond I have noticed more than before. They helped me to organise my work, for example, I asked the pupils to hold up one card when I asked them questions. They responded with the green and red cards. I could easily identify the percentage of pupils who understood the concept and those who didn't. I could identify those who had raised red cards, ask them about their doubts, and was able to provide instant feedback, which not only cleared the doubts of individual pupils, but also all similar doubts among other pupils.

Does using response cards help you to identify pupils' level of understanding?

Yes, it did, because they [the colour response cards] help pupils to arrange and master the work, and they start by making decision before holding up a colour card, for example, if they know the answer, they hold up the green card and if they don't know the answer, they hold up the red card. Also, [the cards] helped me to improve their behaviour, motivate them, and encourage them to engage with me. However, difficulties were encountered when the pupils raised their colour response cards. Some pupils did not want to answer the questions and they raised the red card to protect themselves and feel safe that the teacher would not ask them to answer.

Would you recommend adopting the colour response cards strategy to another teacher?

Yes, I believe it can be implemented across various subjects, as it is easy to use and does not take much effort in learning and training.

Overall, did you think that the colour response card intervention helped your pupils academically in the classroom?

Yes, I noticed that one girl, who had a disability, started to use the cards regularly, which meant that they [the colour response cards] motivated her to engage, and she was happy using them, as well as answering correctly. Thus, I believe it helps pupils in improving their academic engagement.

How do the colour response cards impact the pupils' behaviour?

The teacher can adopt this strategy to monitor the pupils and their performance levels, and in addition, identify higher- and lower-performing pupils in such a way as to encourage them to interact with each other... thereby increasing their academic engagement through active and collaborative approaches.

Table B2-1:

Categorising statements into codes, sub-themes, and themes

Statements	Codes	Sub-themes	Main Themes
<i>Yes, the pupils looked more motivated to participate in the classroom. I observed them to be more engaged than before, and their attention towards the lessons had increased. They were mostly eager about the questions that I would ask, and that they would get a chance to respond.</i>	Attention, P:interest, motivation	Increased attention	Positive elements of colour response cards on pupils
<i>The teacher can adopt this strategy to monitor the pupils and their performance levels and in addition identify higher- and lower-performing pupils in such a way as to encourage them to interact with each other... thereby increasing their academic</i>	Assessment, competencies	Better performance	

<p>engagement through active and collaborative approaches...</p>			
<p>Yes, because they [the colour response cards] help pupils to arrange and master the work, and they start by making a decision before holding up a colour card, for example, if they know the answer, they hold up the green card and if they don't know the answer, they hold up the red card. This process helps me in deciding whether or not to proceed with the next concepts during the teaching.</p>	<p>Attention, performance, Pupils' confidence, positive behaviour, Teachers' Confidence</p>	<p>Self-confidence</p>	
<p>Yes, I noticed that one girl, who had a disability, started to use the cards regularly, which means they [the colour response cards] gave her motivation to engage, and she was happy when using them, as well as answering correctly. Thus, I believe it helps pupils in improving their academic engagement.</p>	<p>Pupils' confidence, enjoyment, motivation, positive behaviour</p>	<p>Fun and enjoyment</p>	
<p>Yes, using colour response cards can help me to communicate with pupils, which is the most important aspect of classroom management. They [the colour response cards] also help me to build strong relationships with pupils and encourage them in their self-learning process. In addition, I should say, that this is a great tool for motivation and achievement, and I work more at engaging the pupils in the subject matter.</p>	<p>Managing the Classroom, T:interest, motivation</p>	<p>Effective feedback from teachers</p>	<p>Positive impact on teachers</p>
<p>Maybe it does, because as I mentioned before, these cards make me notice my pupils more than before. Their behaviour toward the lesson and how they respond I have noticed more than before. In addition, providing instant feedback has helped the pupils follow the lessons and concepts in a more effective way than before. It may be because their doubts were cleared instantly, which led them to follow the continuing and relevant concepts.</p>	<p>Assessment teaching, strategies, feedback</p>		
<p>To some extent, yes, because I have noticed now the the pupils are better than before I feel happy to move on. They are happy that their doubts are cleared instantly and are more active and motivated towards learning. This change in behaviour and</p>	<p>positive behaviour, managing the classroom, decision-making, Teachers' Confidence</p>	<p>increased teacher confidence</p>	

<p><i>pupils' attitudes towards learning helped me to reflect positively on my teaching practices because of the change I noticed among the pupils.</i></p>			
<p><i>I think the colour response card approach is easy to implement. It can be applied in other subjects as well. As the concepts in all other subjects are at primary [school] level, and these are the basics that pupils need to learn and retain, I feel it is beneficial to use colour response cards in other subjects as well. Therefore, I did share my experiences with the science teacher in the school.</i></p>	<p>Application in other subjects, benefits, experiences, T:easy to use</p>	<p>Sharing experience with colleagues</p>	<p>Future use of colour response cards</p>
<p><i>be implemented across various subjects, as it is easy to use and does not take much effort in learning and training...</i></p>	<p>Application in other subjects, T:easy to use, experiences</p>	<p>Benefits from using colour response cards in other subjects</p>	

B2.2. Muna's Interview transcript

Have you noticed any changes since you started using colour response cards?

Yes, the pupils began to concentrate more and focused on the important information that I was giving to them. Pupils can have problems paying attention to their teachers from time to time, but after using the colour response cards, the pupils were more focused and paid attention to what I was saying.

How do colour response cards help you in taking decisions for teaching pupils?

Yes, they [the colour response cards] are very useful for active learning, because they help pupils to make a decision, such as whether the answer is correct or not. If the answer is incorrect, the pupil can get help from the teacher or peers to correct it.

What is the impact of using colour response cards on preparing lesson plans?

During lesson three I realised that many green cards were raised, and I gave them [the pupils] positive feedback. Moreover, I felt more confident. The positive approach of appreciation motivated the pupils. As a result, they changed their attitudes towards learning, and became more disciplined and attentive.

What are the advantages of using colour response cards?

I have seen a gradual improvement in pupils' performance. For instance, pupils who, earlier, could not answer a question about a maths concept, are now starting to respond more quickly.

What are the disadvantages of using colour response cards?

Pupils' may get bored eventually using them as they get older and move on to higher classes. I think, it may not suit older students.

How can using colour response cards help teachers in some form of direct daily measurement to guide instructional decision-making?

Yes, they help me, because this colour response card technique is a quick way to get feedback from pupils. When some pupils raised the red card, I realised that I needed to explain more, and they helped me ascertain how well a pupil understood the lesson.

Do you think using colour response cards encourage teachers to reflect on their own teaching strategies? If yes, or no, why?

Yes. Using the colour response cards not only encourages the pupils' self-assessment, for it can also help teachers adjust their instructions according to the pupils' learning needs. It is important that pupils' basic needs are accurately assessed and accordingly, the teachers need to adopt strategies to address them.

Has the colour response card strategy given you an opportunity to reflect on how you view learning and behaviour? If so, please give details.

One important thing that I observed was that using colour response cards, I could easily identify pupils who had difficulties in learning and who could not actively engage in learning; as a result, they tended to engage in the disruptive behaviour displayed by other pupils. However, when colour response cards were implemented, I observed that those pupils who were less attentive were actively engaged and exhibited more positive behaviour. In addition, positive appreciation from me made them more motivated, and they actively engaged in classroom lessons. I would like to share my experiences, so that other teachers can also benefit from them.

I have more control in managing the class than before, because of the experience that I had, and I have gained more confidence in my teaching. I now know how to manage the class, identify those who disturb the class, and how to engage those pupils with disruptive behaviour in classroom learning.

Does using response cards help you to identify pupils' level of understanding?

Yes. They allow me to identify pupils' who have difficulty in understanding few concepts of a lesson and helps me to focus on these pupils' by explaining them the concepts again and assess them again.

Would you recommend adopting the colour response cards strategy to another teacher?

To be honest with you, I have changed my mind after using colour response cards, because they were easy to use and were more effective. I would definitely use them again in the classroom... It was an eye opener for me, and it changed my perspective on how to manage the class. I would definitely recommend this technique for other teachers.

Overall, did you think that the colour response card intervention helped your pupils academically in the classroom?

Yes. I could identify pupils' who have difficulties in learning by assessing their levels of understanding, and mostly they are the ones who are disruptive in classroom. By paying special attention to them and encouraging them to use colour response cards, I was successful not only in making them focused on classroom learning but also in reducing their disruptive behaviours which could affect whole classroom.

How do the colour response card impact pupils' behaviour?

The colour response card pupils got so excited whenever I decided to engage them in some gameplay with the colour response cards and there was a fun atmosphere. I can say that CRCs helped me in improving interaction with pupils.

Table B2-2:

Categorising statements into codes, sub-themes, and themes for Muna's interview data

Statements	Codes	Sub-themes	Main Themes
<i>Yes, the pupils began to concentrate more and focused on the important that I was giving to them. Pupils can have problems paying attention to their teachers from time to time, but after using the colour response cards, the pupils were more focused and paid attention to what I was saying.</i>	Attention, P:interest, Positive behaviour	Increased attention	Positive elements of colour response cards on pupils

I have seen a gradual improvement in pupils' performance. For instance, pupils who, earlier, could not answer a question about a maths concept, are now starting to respond more quickly.

Yes, they [the colour response cards] are very useful for active learning, because they help pupils to make a decision, such as whether the answer is correct or not. If the answer is incorrect, the pupil can get help from the teacher or peers to correct it.

The colour response card pupils got so excited whenever I decided to engage them in some gameplay with the colour response cards and there was a fun atmosphere. I can say that CRCs helped me in improving interaction with pupils.

I have more control in managing the class than before, because of the experience that I had, and I have gained more confidence in my teaching. I now know how to manage the class, [redacted], and how to engage those pupils with disruptive behaviour in classroom learning.

Yes, they help me, because this colour response card technique is a quick way to get feedback from pupils. When some pupils raised the red card, I realised that I needed to explain more, and they helped me ascertain how well a pupil understood the lesson.

During lesson three I realised that many green cards were raised, and I gave them [the pupils] positive feedback. Moreover, I felt more confident. The positive approach of appreciation

performance, Better performance skills

Skills, pupils' confidence, positive behaviour

fun, enjoyment,

Managing the Classroom, Teachers' confidence
Adaptability, Assessment

Managing the Classroom, Approaches, teaching strategies,

Positive behaviour, Teachers' confidence
Motivation,

Managing the Classroom
Positive impact on teachers

Effective feedback from teachers

Increased confidence
teacher

motivated the pupils. As a result, they changed their attitudes towards learning, and became more disciplined and attentive.

Yes. I could identify pupils' who have difficulties in learning by assessing their levels of understanding, and mostly they are the ones who are disruptive in classroom. By paying special attention to them and encouraging them to use colour response cards, I was successful not only in making them focused on classroom learning but also in reducing their disruptive behaviours which could affect whole classroom.

Using the colour response cards not only encourages the pupils' self-assessment, for it can also help teachers adjust their instructions according to the pupils' learning needs. It is important that pupils' basic needs are accurately assessed and accordingly, the teachers need to adopt strategies to address them.

Yes. They allow me to identify pupils' who have difficulty in understanding few concepts of a lesson and helps me to focus on these pupils' by explaining them

Approaches

Assessment

Approaches

Managing
the
Classroom

Quality,
Adaptability

Adjusting instructions according to pupils' needs

Benefit

the concepts again and assess them again.

One important thing that I observed was that using colour response cards, I could easily identify pupils who had difficulties in learning and who could not actively engage in learning; as a result, they tended to engage in the disruptive behaviour displayed by other pupils. However, when colour response cards were implemented, I observed that those pupils who were less attentive were actively engaged and exhibited more positive behaviour. In addition, positive appreciation from me made them more motivated, and they actively engaged in classroom lessons. I would like to share my experiences, so that other teachers can also benefit from them.

To be honest with you, I have changed my mind after using colour response cards, because they were easy to use and were more effective. I would definitely use them again in the classroom... It was an eye opener for me, and it changed my perspective on how to manage the class. I would definitely recommend this technique for other teachers.

Positive behaviour,

Sharing experience with colleagues

Future use of colour response cards

Motivation,

Skills,

experiences

T:easy to use,

experiences

Benefits from using colour response cards in other subjects

B2.3. Amal Interview transcript

Have you noticed any changes since you started using colour response cards?

Yes, the pupils became more disciplined about participating in class. I observed that they had reduced their talking in class. They were attentive, focused, and engaged in the classroom lesson, much better than before

How do colour response cards help you in taking decisions for teaching pupils?

Yes, they helped me to organise my work, for example, I asked the pupils to hold up one card when I asked them questions. They responded with the green and red cards. I could easily

identify the percentage of pupils who understood the concept and those who didn't. I could identify those who had raised red cards, ask them about their doubts, and was able to provide instant feedback. This not only cleared the doubts of individual pupils, but also, all similar doubts among other pupils.

What is the impact of using colour response cards on preparing lesson plans?

They indirectly helped me in organizing lesson plans by assessing the pupils' understanding levels of current lesson, as it led to the changes or modifications in the timeline, I prepared for delivering lessons. This is because, I gave extra time for lessons which pupils took time in understanding.

What are the advantages of using colour response cards?

I think, there are many. Its easy to use. Helps in easy assessment of pupils. Cost-effective. Particularly suits kindergarten pupils' as they find it enjoyable, which motivates them in learning and increasing focus.

What are the disadvantages of using colour response cards?

Pupils' use them frequently and they get spoiled easily and need to be replaced by new ones. Few pupils took time in understanding its usage.

How can using colour response cards help teachers in some form of direct daily measurement to guide instructional decision-making?

This type of card can have multiple functions, such as identifying whether the pupils understand the lesson or not, or whether they have any questions about the lesson. I can put the pupils holding up green cards together, in order to spend time helping the pupils who are holding up red cards.

Do you think using colour response cards encourage teachers to reflect on their own teaching strategies? If yes, or no, why?

The teacher can adopt this strategy to observe pupils become more motivated about learning and confident in their abilities. In addition, adopting this strategy could help create opportunities for pupils to receive continuous and specific feedback that helps them improve.

Has the colour response card strategy given you an opportunity to reflect on how you view learning and behaviour? If so, please give details.

I like the strategy of these cards as they were enjoyable by the young kids and pupils were having fun in using them. I feel it was a good idea, particularly the aspect that was generated in the classroom, which stimulated both the pupils and teachers.

Does using response cards help you to identify pupils' level of understanding?

I do not have an assistant teacher, so it uses up my time allocating and collecting them [the colour response cards] from pupils. I feel that addressing the questions from all the pupils instantly during lessons in the classroom led to more time being spent on teaching and feedback. As a result, it took more time to complete the lessons and I am lagging behind the schedule in completing the curriculum on time. However, I am happy that the pupils have become more actively engaged in learning and are more disciplined than before. Moreover, it contributes to the quality in learning and teaching process.

Would you recommend adopting the colour response cards strategy to another teacher?

Yes, I will do. But I believe that in order to use these cards, teachers need more training on the functions of the cards and how to use them properly, for those who are interested in applying this strategy in the classroom.

Overall, did you think that the colour response card intervention helped your pupils academically in the classroom?

Yes. in terms of engagement, academic behaviour, and academic scores

How do the colour response cards impact pupils' behaviour?

I have a pupil who used to be very shy, but she has come out of her shell and seems to interact more with her peers now.

Table B2-3:*Categorising statements into codes, sub-themes, and themes for Amal's interview data*

Statements	Codes	Sub-themes	Main Themes
<i>Yes, the pupils became more disciplined about participating in class. I observed that they had reduced their talking in class. They were attentive, focused, and engaged in the classroom lesson, much better than before</i>	Attention, P:interest, positive behaviour	Increased attention	Positive elements of colour response cards on pupils
<i>The teacher can adopt this strategy to observe pupils become more motivated about learning and confident in their abilities. In addition, adopting this strategy could help create opportunities for pupils to receive continuous and specific feedback that helps them improve.</i>	motivation, Skills, Pupils' confidence	Better performance	
<i>Yes. in terms of engagement, academic behaviour, and academic scores</i>	positive behaviour, interest, performance		
<i>I have a pupil who used to be very shy, but she has come out of her shell and seems to interact more with her peers now.</i>	positive behaviour	Self-confidence	
<i>I like the strategy of these cards as they were enjoyable by the young kids and pupils were having fun in using them. I feel it was a good idea, particularly the aspect that was generated in the classroom, which stimulated both the pupils and teachers.</i>	fun, enjoyment, positive behaviour	Fun and enjoyment	

<p>Yes, they helped me to organise my work, for example, I asked the pupils to hold up one card when I asked them questions. They responded with the green and red cards. I could easily identify the percentage of pupils who understood the concept and those who didn't I could identify those who had raised red cards, ask them about their doubts, and was able to provide instant feedback. This not only cleared the doubts of individual pupils, but also, all similar doubts among other pupils.</p>	<p>Managing the Classroom, Approaches Assessment</p>	<p>Managing the Classroom</p>	<p>Positive impact on teachers</p>
<p>This type of card can have multiple functions, such as identifying whether the pupils understand the lesson or not or whether they have any questions about the lesson. I can put the pupils holding up green cards together, in order to spend time helping the pupils who are holding up red cards.</p>	<p>Assessment Approaches</p>	<p>Effective feedback from teachers</p>	
<p>I do not have an assistant teacher, so it uses up my time allocating and collecting them [the colour response cards] from pupils. I feel that addressing the questions from all the pupils instantly during lessons in the classroom led to more time being spent on teaching and feedback. As a result, it took more time to complete the lessons and I am lagging behind the schedule in completing the curriculum on time. However, I am happy that the pupils I am happy that the pupils have become more actively engaged in learning and are more disciplined than before. Moreover, it contributes to the quality in learning and teaching process</p>	<p>Teachers' confidence Work burden, Quality, positive behaviour</p>	<p>Increased confidence</p>	<p>teacher</p>
<p>Yes, I will do. But I believe that in order to use these cards, teachers need more training on the functions of the cards and how to</p>	<p>Benefit Adaptability, experiences</p>	<p>Benefits from using colour response cards in other subjects</p>	

use them properly, for those who are interested in applying this strategy in the classroom.

*I think, there are many. Its **easy to use**. Helps in easy assessment of pupils. **Cost-effective**. Particularly suits kindergarten pupils' as they find it **enjoyable**, which motivates them in learning and increasing focus.*

*Easy to use,
Cost-
effective,
enjoyment,
motivation*

Table B2.4. Codes categorized from the interviews by respective interviewees.

Factors	Rawan	Muna	Amal	Total
Attention	2	1	1	4
P:Interest	1	1	2	4
T:Interest	1	0	0	1
Skills	0	3	1	4
Competencies	1	1	1	3
Performance	1	1	1	3
Pupils' confidence	2	1	1	4
Motivation	3	2	2	7
Fun	0	1	1	2
Enjoyment	1	2	1	4
Positive behaviour	3	3	4	10
T:Easy to use	3	1	1	5
Managing the classroom	2	3	2	7
Assessment	3	2	3	8
Teaching strategies	1	1	0	2
Quality	0	1	1	2
Teachers' confidence	2	2	1	5
Work burden	0	0	1	1
Approaches	0	3	2	5
Feedback	1	0	0	1
Adaptability	1	2	1	4
Application in other subjects	2	0	0	2
Benefits	2	1	1	5
Decision-making	1	0	0	1
Experiences	0	2	1	3
Cost-effective	0	0	1	1

Appendix C: Journal Record

Journal record

For teacher

Notes: this commentary can help you notice any changes you make in the class, what they are and why you make them?



Lesson1 (notes/reflection)		
plan	preparing lesson plans	
	Change plan direct daily measurement	
	No change	
Instruction	help to identify new instruction	
	change their instruction	
	modify instruction based on pupil	
	no change	
Evaluate Feedback	evaluate pupil the level of understanding	
	reflect on their own teaching strategies	
	no change	

Appendix D: Feedback Survey

Name: Class:

Direction:

I am going to ask you some questions about your views after using CRCs. When you answer these questions, tell the truth. Don't worry what your teacher might think. I will be the only person who knows your answers. So tell me what you really think and feel by choosing that face the best matches your feeling.

Choose the face that best matches how you feel:

1	The <u>colour</u> response cards helped me learn	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>
2	The <u>colour</u> response cards helped me to eat my lunch *	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>
3	The <u>colour</u> response cards helped me to listen and be quiet with teacher*	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>
4	The <u>colour</u> response cards helped me to join the teacher*	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>
5	The <u>colour</u> response cards helped me to cooperate with peers in classroom.*	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>	 <input type="checkbox"/>

Note: (*) those items added by the researcher

Appendix E: Mann-Whitney Test for the Disruptive Behaviour Group

Group	N	Conditions	Mean Rank	Sum of Rank
Intervention	27	Pre-intervention	17.09	461.50
		Introduction	14.93	403.00
		Established	14.00	378.00
Control	18	Pre-intervention	31.86	573.00
		Introduction	35.11	632.00
		Established	26.50	657.00
Total	45			

Test Statistics^a

	DBPre	introduction	established
Mann-Whitney U	83.500	25.000	.000
Wilcoxon W	461.500	403.000	378.000
Z	-3.706	-5.058	-5.635
Asymp. Sig. (2-tailed)	<.001	<.001	<.001

a. Grouping Variable: Group

Appendix F: Mann-Whitney Test for the Academic Engagement Group

Group	Academic Engagement	N	Conditions	Mean Rank	Sum of Rank
Intervention	27	Pre-intervention	24.14	659.00	
		Introduction	30.83	832.50	
		Established	30.57	825.50	
Control	18	Pre-intervention	20.89	376.00	
		Introduction	11.25	202.50	

	Established	11.64	209.50
Total	45		

Test Statistics^a

	AEPre	AEIntroduction	AEestablished
Mann-Whitney U	205.000	31.500	38.500
Wilcoxon W	376.000	202.500	209.500
Z	-.884	-4.910	-4.747
Asymp. Sig. (2-tailed)	.377	<.001	<.001

a. Grouping Variable: Group

Appendix G: Friedman Test

Ranks

Mean Rank	
DBPre	2.36
introduction	1.86
established	1.79

Test Statistics^a

N	45
Chi-Square	8.931
df	2
Asymp. Sig.	.011

a. Friedman Test

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
AEPre	45	.6627	.15737	.23	.90
AEIntroduction	45	.6480	.23580	.20	.93
AEestablished	45	.6564	.23187	.19	.93

Ranks

Mean Rank

	Mean Rank
AEPre	1.64
AEIntroduction	2.13
AEestablished	2.22

Test Statistics^a

N	45
Chi-Square	8.931
df	2
Asymp. Sig.	.011

a. Friedman Test

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
DBPre	45	.3751	.15725	.10	.77
introduction	45	.3387	.21820	.07	.80
established	45	.3369	.23017	.07	.87

Ranks

		N	Mean Rank	Sum of Ranks
introduction - DBPre	Negative Ranks	31 ^a	22.98	712.50
	Positive Ranks	13 ^b	21.35	277.50
	Ties	1 ^c		
	Total	45		
established - DBPre	Negative Ranks	28 ^d	21.66	606.50
	Positive Ranks	14 ^e	21.18	296.50
	Ties	3 ^f		
	Total	45		
established - introduction	Negative Ranks	24 ^g	19.94	478.50
	Positive Ranks	19 ^h	24.61	467.50
	Ties	2 ⁱ		
	Total	45		

- a. introduction < DBPre
- b. introduction > DBPre
- c. introduction = DBPre
- d. established < DBPre
- e. established > DBPre
- f. established = DBPre
- g. established < introduction
- h. established > introduction
- i. established = introduction

Test Statistics^a

	introduction - DBPre	established - DBPre	established - introduction
Z	-2.539 ^b	-1.938 ^b	-.066 ^b
Asymp. Sig. (2-tailed)	.011	.053	.947

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
AEPRE	45	.6627	.15737	.23	.90
AEIntroduction	45	.6480	.23580	.20	.93
AEestablished	45	.6564	.23187	.19	.93

Ranks

		N	Mean Rank	Sum of Ranks
AEIntroduction - AEPRE	Negative Ranks	13 ^a	31.92	415.00
	Positive Ranks	31 ^b	18.55	575.00
	Ties	1 ^c		
	Total	45		
AEestablished - AEPRE	Negative Ranks	11 ^d	25.32	278.50
	Positive Ranks	25 ^e	15.50	387.50
	Ties	9 ^f		
	Total	45		
AEestablished - AEIntroduction	Negative Ranks	14 ^g	15.36	215.00
	Positive Ranks	20 ^h	19.00	380.00
	Ties	11 ⁱ		
	Total	45		

- a. AEIntroduction < AEPRE
- b. AEIntroduction > AEPRE
- c. AEIntroduction = AEPRE
- d. AEestablished < AEPRE
- e. AEestablished > AEPRE
- f. AEestablished = AEPRE
- g. AEestablished < AEIntroduction
- h. AEestablished > AEIntroduction
- i. AEestablished = AEIntroduction

Test Statistics^a

	AEIntroduction - AEPRE	AEestablished - AEPRE	AEestablished - AEIntroduction
Z	-.934 ^b	-.856 ^b	-1.412 ^b
Asymp. Sig. (2-tailed)	.350	.392	.158

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Appendix H: Linearity Testing

Figure A1:

Testing linearity in the pre-intervention for intervention group's Disruptive behaviour (DB)

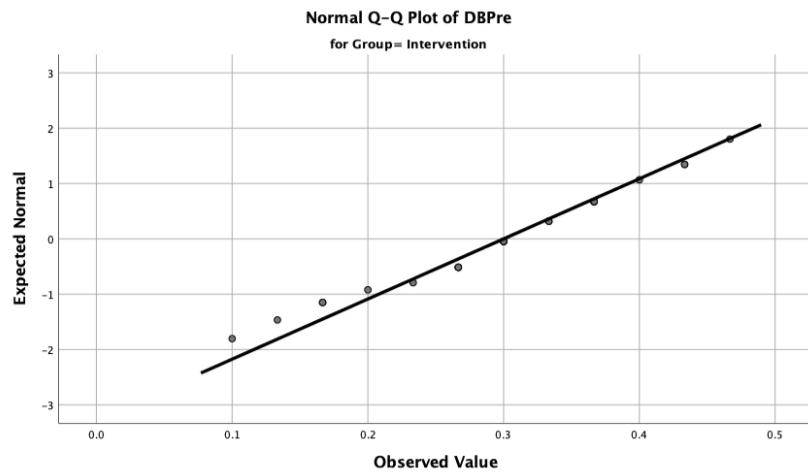


Figure A2:

Testing linearity in the pre-intervention for control group's disruptive behaviour (DB)

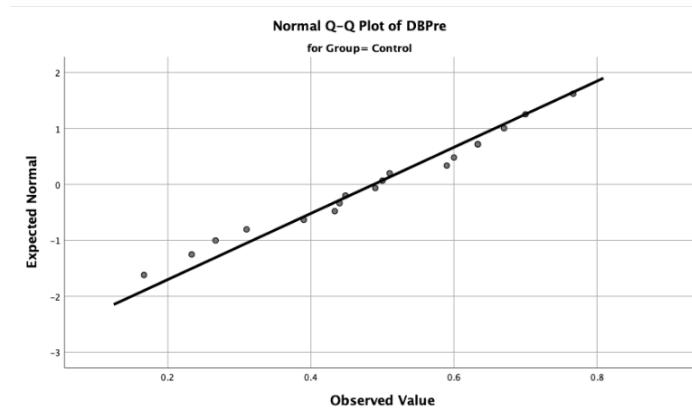


Figure A3:

Testing linearity in the introduction for control group's disruptive behaviour (DB)

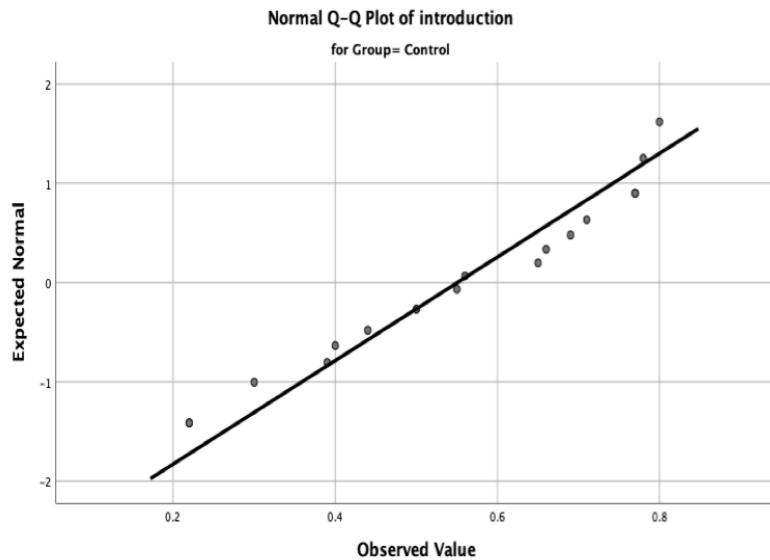


Figure A4:

Testing linearity in the introduction for intervention group's disruptive behaviour (DB)

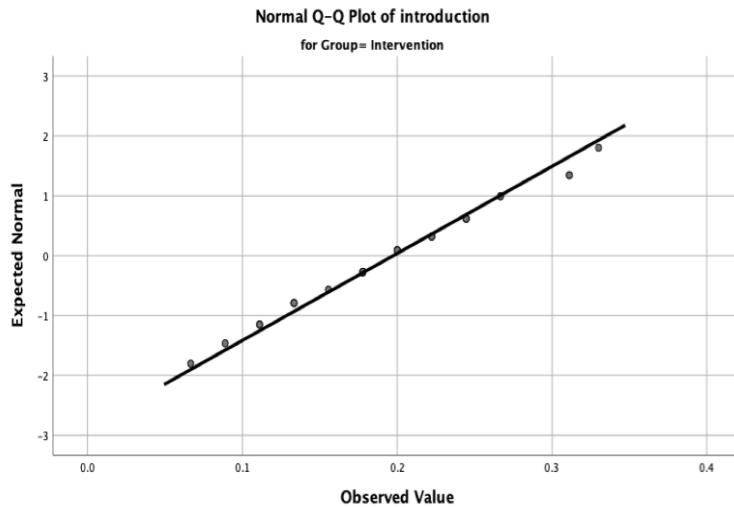


Figure A5:

Testing linearity in the established for intervention group's disruptive behaviour (DB)

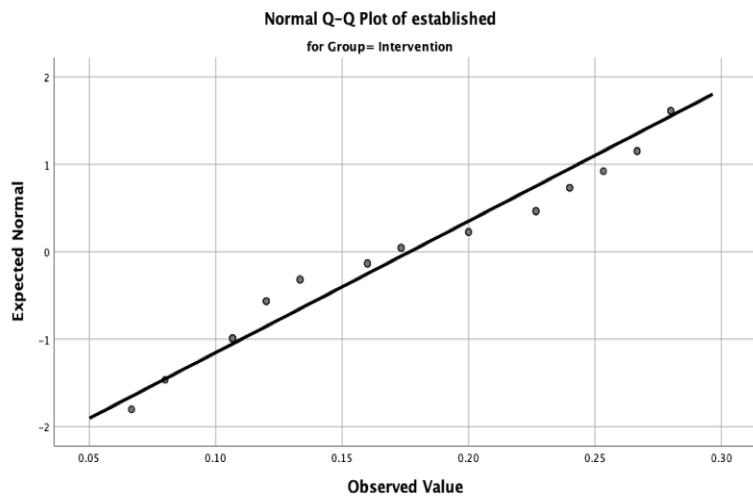


Figure A6:

Testing linearity in the established condition for control group's disruptive behaviour (DB)

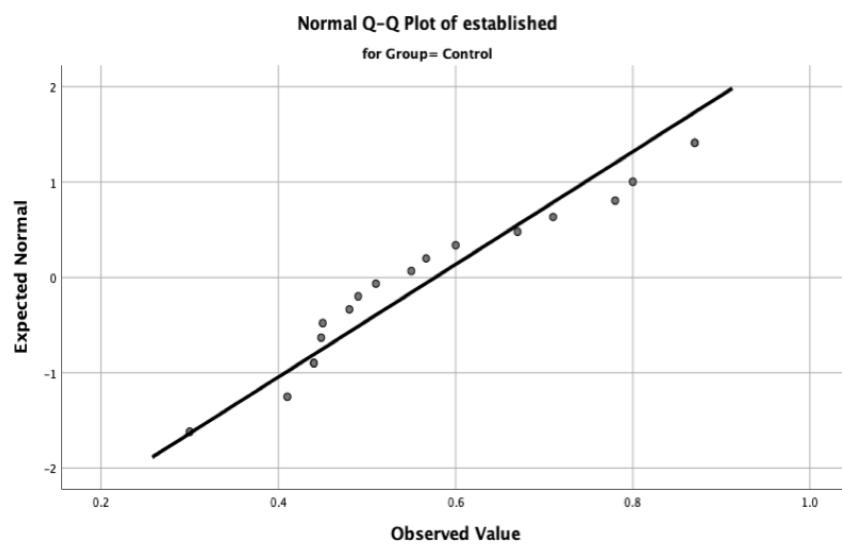


Figure A7:

Testing linearity in the pre-intervention condition for the intervention group's academic engagement (AE)

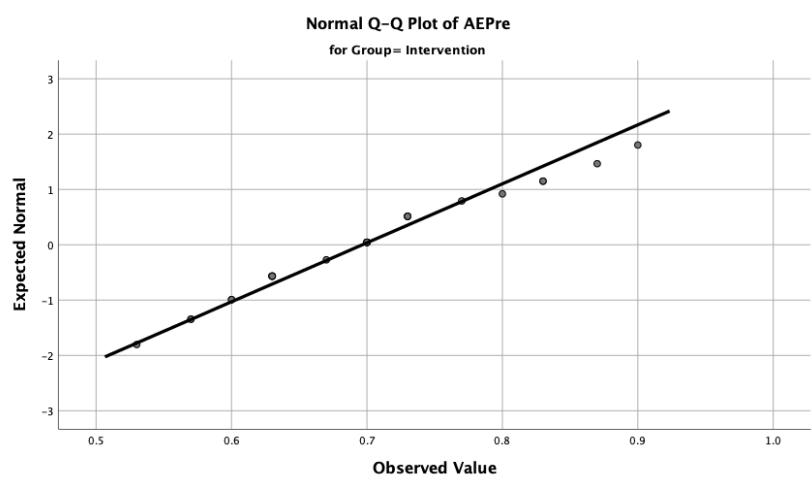


Figure A8:

Testing linearity in the pre-intervention condition for the control group's academic engagement (AE)

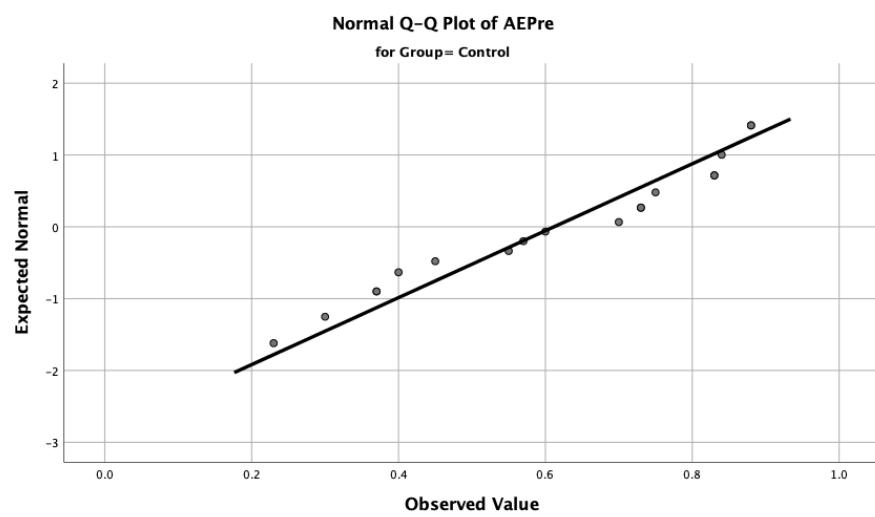


Figure A9:

Testing linearity in the introduction condition for the intervention group's academic engagement (AE)

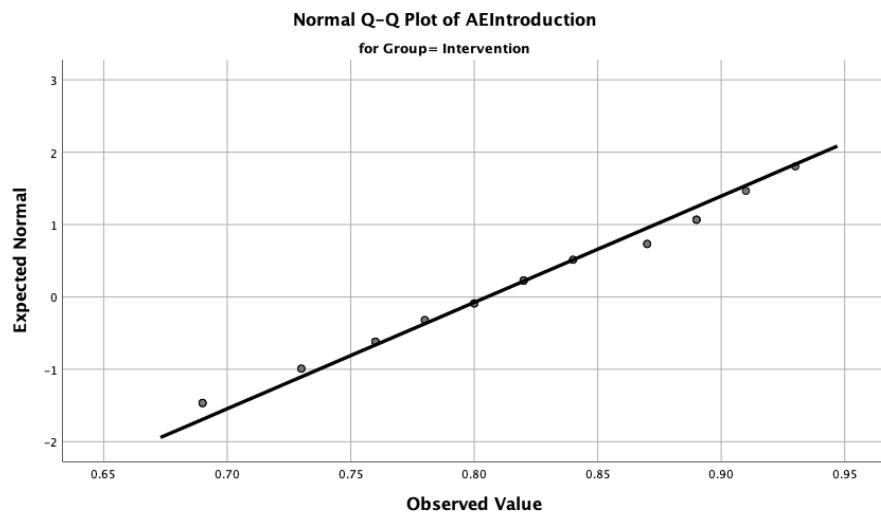


Figure A10:

Testing linearity in the introduction condition for the control group's academic engagement (AE)

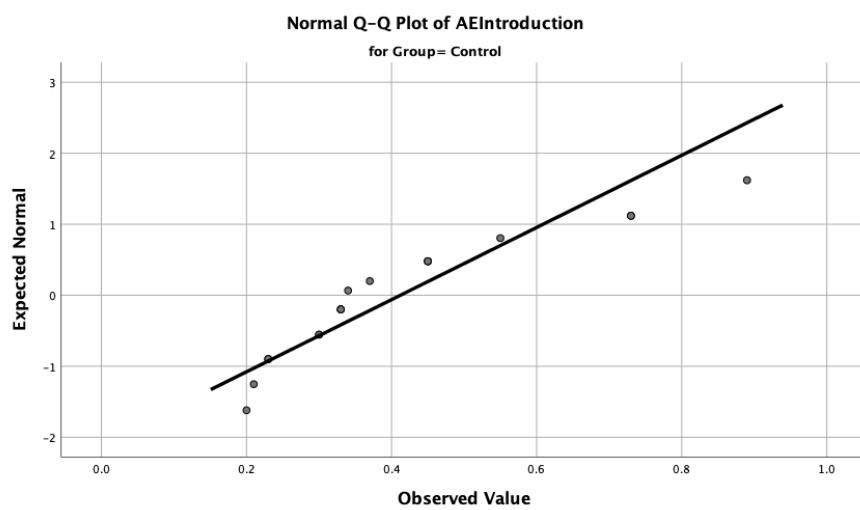


Figure A11:

Testing linearity in the established condition for the intervention group's academic engagement (AE)

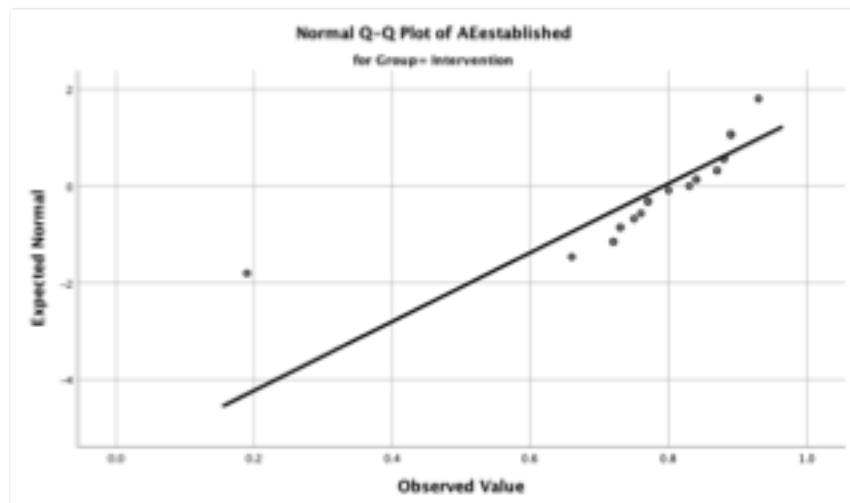
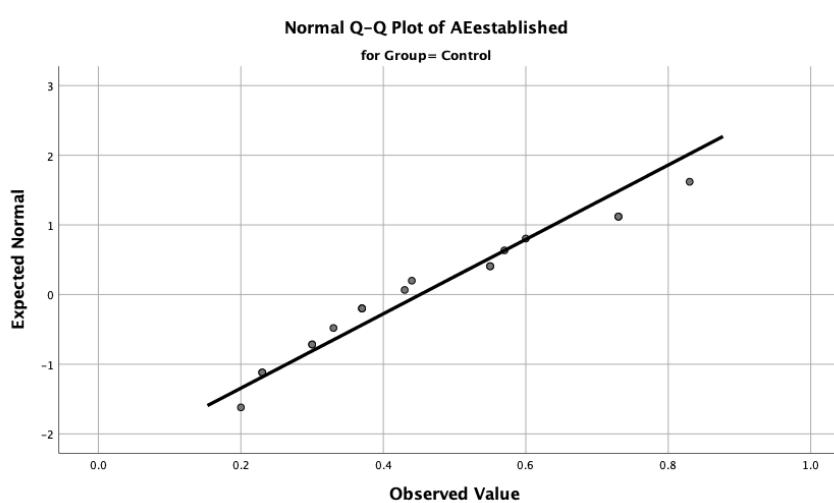


Figure A12:

Testing linearity in the established condition for the control group's academic engagement (AE)



Appendix I: Permission Obtained

C: SIGNATURE OF APPLICANT:

Note: a signature is required. Typed names are not acceptable.

I have declared all relevant information regarding my proposed project and confirm that ethical good practice will be followed within the project.

Signed:  print Name: Sharifah Alghamdi Date.....

STATEMENT OF ETHICAL APPROVAL FOR PROPOSALS SUBMITTED TO THE INSTITUTE ETHICS COMMITTEE

This project has been considered using agreed Institute procedures and is now approved.

Signed:  Print Name..... Jill Porter..... Date..... 13/3/18.

(IoE Research Ethics Committee representative)*

* A decision to allow a project to proceed is not an expert assessment of its content or of the possible risks involved in the investigation, nor does it detract in any way from the ultimate responsibility which students/investigators must themselves have for these matters. Approval is granted on the basis of the information declared by the applicant.

Appendix J1: Administrator's Consent Form

Student: Sharifah Alghamdi
Tel.: + (44) 7751171623
+ (966) 539309800
Email: S.I.M.Alghamdi@pgr.reading.ac.uk
Supervisor: Professor Helen Bilton
Email: h.o.bilton@reading.ac.uk



Administrator's Consent Form

Title of study: *An Examination of the Impact of Colour Response Cards on Teacher-Pupil Classroom Interaction in a Primary School in Saudi Arabia*

I have read the Information Sheet about the project and received a copy of it.

I understand the purpose of this study is and what is required of me. All my questions have been answered and I am happy for my school to take part in this research.

Name of Administrator: _____

Name of primary school: _____

Please tick as appropriate:

I consent to the involvement of my school in the project, as outlined in the Information Sheet

Signed: _____

Date: _____

Appendix J2: Head Teacher's Consent Form

Student: Sharifah Alghamdi
Tel: + (44) 7751171623
+(966) 539309800
Email: S.I.M.Alghamdi@pgr.reading.ac.uk
Supervisor: Professor. Helen Bilton
Email: h.o.bilton@reading.ac.uk



Head teacher's Consent Form

Title of study: An examination of colour response cards' impact on teacher and pupil classroom interaction in a primary school in Saudi Arabia

I have read the information sheet about the project and received a copy of it. I understand what the purpose of the study is, and what is required of me. All the questions have been answered.

Name of Head Teacher: _____

Name of the school: _____

Please tick as appropriate:

I consent to the involvement of my school in the project as outlined in the Information Sheet

Signed: _____

Date: _____

Appendix J3: Class Teacher's Consent Form



Teachers' Consent Form

Project title: An Examination of the Impact of Colour Response Cards on Teacher-Pupil Classroom Interaction in a Primary School in Saudi Arabia

I have read and had explained to me the Information Sheet relating to this project.

I have had explained to me the purposes of this project and what will be required of me. All my questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet, insofar as they relate to my participation.

I understand that pupils will be observed and that these observations will be video-recorded.

I understand that I will be interviewed and that the interview will be audio-recorded and transcribed.

I understand that I will write 'What?' and 'Why?' notes in a journal record for each session.

I understand that my participation is entirely voluntary and that I have the right to withdraw from this project at any time, without needing to give a reason and without repercussions.

I have received a copy of this Consent Form and of the accompanying Information Sheet.

Please tick as appropriate:

I consent to write notes in a journal record for each session:

_____ _____
Yes No

I consent to being interviewed:

_____ _____
Yes No

I consent to this interview being audio-recorded:

_____ _____
Yes No

Name:

Signature:

Appendix J4: Consent Form for Pupils' Parents

Student: Sharifah Alghamdi
Tel.: + (44) 7751171623
+ (966) 539309800
Email: S.I.M.Alghamdi@pgr.reading.ac.uk
Supervisor: Professor Helen Bilton
Email: h.o.bilton@reading.ac.uk



Parent/Guardian Consent Form

To be completed by a parent or guardian who **DOES NOT AGREE** to their child taking part in the study: *An Examination of the Impact of Colour Response Cards on Teacher-Pupil Classroom Interaction in a Primary School in Saudi Arabia*

Name of Researcher: Sharifah Alghamdi

Please tick as appropriate:

1. I confirm that I have read and understand the information sheet, dated.....

For the above study and have had the opportunity to ask questions.

2. I DO NOT wish my child to take part in the above study.

Your name

Full name of your child.....

Signature of Parent/Guardian..... Date of signature.....

Parental Opt-out Consent

Appendix J4: Pupils' Consent Form



Note: this form is for young children. The statements are read and the child colours the face to indicate consent or not.

My Consent Form

	<u>Yes</u>	<u>No</u>
Miss Sharifah has told me about the reason of using colour response cards.	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.
Miss <u>Sharifah</u> has answered the questions I have had about using colour response cards in Maths class.	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.
I know that I will be telling Miss Sharifah how I feel about using colour response cards in Maths class and answering questions.	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.
I am happy for Miss Sharifah to use my work for her project.	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.
I understand what the study is about.	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.
I understand that I don't have to take part and can drop out of the study at any time.	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.
I agree to take part in this study	A simple line drawing of a smiling face with two small circles for eyes and a curved line for a mouth.	A simple line drawing of a sad face with two small circles for eyes and a downward-curved line for a mouth.

My Name:
Date:

Appendix K: Pupils' Information Sheet

What Happens next

Your parents have been sent a letter asking for their permission for you to take part in this project.

I will check with you before I do the tasks that you are happy to help me with my project.

If you have any questions please speak to your class teacher. Or you can contact:

Sharifah alghamdi
Email:
S.I.M.Alghamdi@pgr.reading.ac.uk

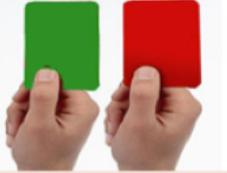


Research Teams:
Professor. Helen Bilton
Professor. Jill Porter
Mrs. Sharifah Alghamdi

This project has been reviewed following the Procedures of the University of Reading Research Ethics Committee and has been given a favorable ethical opinion for conduct.

 **University of Reading**
Institute of Education
London Road Campus
RG1 5EX

Pupils information sheet
Research Project



Information Sheet

This study will investigate the impact of using colour response cards on students' academic engagement and disruptive behaviour, as well as on the feedback obtained from the participating pupils. I would like you to help me. I have already asked your parents and Head Teacher if they are happy for you to help me.

Why have I been invited to take part?

You have been invited to take part because you will use the colour response cards in math class.

Will anyone know about my behaviour?

Only the people working on the project will know. I won't tell your school or your parents how you do in class.

What will I have to do if I agree to take part?

I will see you at school for no longer than 30-40 minutes during school time. In addition, I will ask you to answer some questions about using colour cards.



Will it help me if I take part?

I think you will find it interesting and fun to using colour cards. Your will help us to understand if you can join in with the teacher.

Do I have to take part?

No, also, you can stop helping me with my study at any time, without giving a reason. Just ask me, your teacher or your parents to tell me if you want to stop.

Appendix L1: Activity Plan

Grade: First	Subject: Mathematics	Second Semester
Teaching and Learning Experiences		
Educational learning activities	Learners will do the following	Teacher will do the following
<ul style="list-style-type: none"> ■ Preparation and introduction: telling a story from life relating to the unit theme and discussing it with the students; asking a suitable question for reflection and discussion in preparation for the unit theme. ■ Presenting cards where the vocabulary for this unit is written or an explanatory brochure is read by one of the students. The rest of the students follow up with him or her to gain a general idea of the whole unit. ■ Asking basic questions and checking understanding by presenting vocabulary and educational experiences from the unit lessons via the learning schedule and strategy ('What do I know?' – 'What do I want to know?' – 'What do I learn?'). The teacher then distributes the corresponding tables to students, who record what they know about the vocabulary. After reviewing the tables, the teacher displays reinforcement information via the overhead projector with transparencies or PowerPoint slides, and discusses this with the students each term. ■ Distributing the achievement file, which contains the vocabulary and should be empty. The students then fill in this file by themselves and the teacher should follow up and reinforce what needs to be done. ■ Giving the students a homework task, where they answer the unit questions and discuss these questions in groups in a complete session. ■ Administering a test at the end of the unit to ensure that the students master the vocabulary for the unit. 	<ul style="list-style-type: none"> * Discussion and dialogue * Write research * Make a notebook * Perform activities from the student and activity book * Fill in the worksheet * Participate in mental maps or concept maps * Collect information 	<ul style="list-style-type: none"> * Present introduction * Define the teaching strategy (cooperative thinking – dictation method – activity learning – dialogue and discussion – critical thinking) * Typical reading of texts * Appropriate reinforcement * Prepare worksheet * Prepare mental maps and concept map

Appendix L2: Teachers' Plan

Grade: First	Subject: Mathematics	Second Semester
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Unit Name:	Geometric Shapes and Fractions	Grade:	Primary First
The performance task	<p>- Your task is represented as:</p> <ol style="list-style-type: none"> 1. Write a paper that includes unit vocabularies supported by pictures from the Internet or other references 2. Make a notebook that includes: <ul style="list-style-type: none"> • Pictures of life to support the unit • Mental maps and concept maps • Abbreviations for the unit vocabulary under the title 'Remember that' • Comparison tables • The Holy Quran and Mathematics • Scientific enrichment from the textbook 		
O	<p>Your task: Teacher</p> <p>Objective: Employment of language lessons</p> <p>The problem and the challenge: to present it in an interesting and smooth way, bringing benefit and pleasure to the reader</p>		
R	<p>You are: a distinguished teacher</p> <p>Your job: to implement the story and the poster</p>		
A	<p>Audience</p>		
S	<p>Situation</p>		
P	<p>Result, performance and purpose</p> <ul style="list-style-type: none"> • Implement story and poster drawing 		
C	<p>Criteria and standards of success</p> <ul style="list-style-type: none"> ❖ Familiarity with the story and poster aspects ❖ Do it in an interesting and pleasant way ❖ Inclusiveness ❖ Linguistic, creative and literary aspects 		

Subject:	Educational Supervisor:	School Director:
.....

Appendix L3: Lesson Plan

Grade: First	Subject: Math	Second Semester
Title	Geometric Shapes and Fractions	Day
		Date

Unit summary	Solids- Classification of solids, roll over, compact, slide- flat shapes and solids- flat shapes- identical parts- half- one third and one quarter- cumulative test	Session- class
		Time period

Step 1: Identifying the desired learning outcomes

Basic objectives

At the end of this unit, the student is expected to be able to:

- Define the solids seen
- Compare flat shapes and solids
- Complete mid-chapter test successfully
- Classify solids in terms of rolling over, compacting or sliding
- Look for a pattern to answer the question
- Recognize and classify flat shapes.
- Answer the cumulative test successfully

Great ideas (Remaining understandings)	Basic questions
<p>Great idea:</p> <p>Define geometric shapes, fractions, and their uses</p> <p>Learners will be able to understand the following:</p> <ul style="list-style-type: none"> - The comparison between flat shapes and solids through training in them - A third, a quarter, and other mathematical fractions are necessary in our public and private lives. - Answering the chapter test and cumulative test successfully is an evidence of unit mastery - Handling errors such as mixing the shapes of solids and fractions 	<p>Q: Differentiate the shapes of my school tools and name them</p> <p>Q: Write the vertices and sides of the square and the triangle</p> <p>Q: Write a quarter and a third</p>
The main knowledge and skills that learners will acquire by the end of the unit	
Learners will know	<p>Learners will be able to</p> <ul style="list-style-type: none"> ❖ Solids- Classification of solids, roll over, compact, slide- flat shapes and solids- flat shapes- identical parts- half- one third and one quarter- cumulative test

Step 2: Identify proof and evidence of the achievement of learning outcomes					
The performance task	❖ Perform the achievement file task				
Main standards	<ul style="list-style-type: none"> ✓ Achieved high scores in the exams ✓ Ability to answer exercise questions in the textbook. ✓ Proof provided in the follow-up Table prepared (beginner, advanced, qualified, and distinguished). 				
Other evidence	<p>- <u>Through the following evidence:</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 5px;"> <ul style="list-style-type: none"> * Homework activity * Writing a summary </td> <td style="width: 25%; padding: 5px;"> <ul style="list-style-type: none"> * Short impromptu tests * Long exams </td> <td style="width: 25%; padding: 5px;"> <ul style="list-style-type: none"> * Academic reminder * Notes </td> <td style="width: 25%; padding: 5px;"> <ul style="list-style-type: none"> * Notebooks * Self-evaluation </td> </tr> </table>	<ul style="list-style-type: none"> * Homework activity * Writing a summary 	<ul style="list-style-type: none"> * Short impromptu tests * Long exams 	<ul style="list-style-type: none"> * Academic reminder * Notes 	<ul style="list-style-type: none"> * Notebooks * Self-evaluation
<ul style="list-style-type: none"> * Homework activity * Writing a summary 	<ul style="list-style-type: none"> * Short impromptu tests * Long exams 	<ul style="list-style-type: none"> * Academic reminder * Notes 	<ul style="list-style-type: none"> * Notebooks * Self-evaluation 		

Appendix L4: Teaching Strategies

Strategy	Think and Share
Describe the strategy	Based on students' excitement so that each student thinks individually. Each pair of students then discuss their ideas, after which the students discuss their ideas at group level.
Teacher's role	Explains the strategy to the students before implementation, dividing tasks among the students, setting different exercises and giving the students feedback, asking them to first answer individually, then with a peer, and then sharing with the rest of the group and setting timescales in the three stages of the strategy.
Learner's role	Thinking individually about the problem introduced, thinking out loud with a peer, and participating in the learning process.
Strategy	Moving from concrete and almost concrete to abstract (Concrete Representational Abstract (CRA))
Describe the strategy	Building the concept for students in successive stages, from concrete to semi-concrete, then to abstract.
Teacher's role	Helping students to understand concepts in a concrete way, linking concepts with each other and linking skills and concepts.
Learner's role	The student must explain the relationships that link the concepts with each other and upon nature of the relationship, drawing upon the experience acquired in sentences and phrases of moral substance.

Appendix L5: Teaching Aids

Teaching Aids	
Name of educational method	Flash animation
Educational method	A group of animations to support the teaching of listening skills
Name of educational method	Educational pictures
Educational method	A collection of banknotes
Additional attachments	
Name of educational method	Smart devices

Appendix L6: Assessment Plan

Subject	Lesson topic	Date	Grade and Stage	Number of Classes
Mathematics	Counting money	20/05/1441	General education - Primary school - Second grade - Second semester	1
Introduction				
Review previous experiences (involving money) using a similar activity in the (1). Hand out banknotes to a group of students; ask them about the banknotes:				
<ol style="list-style-type: none"> 1. Sort the banknotes according to their value, from the highest to lowest 2. Which banknote has the highest value? 3. Which banknote has the lowest value? 				
Distribute cards similar to those in Ithra. Include some items with the price. Ask students the following questions: How much money is sufficient to buy this card? Do you have enough money to buy it? Writing the idea of the lesson: Find the value of a set of banknotes to judge the possibility of purchasing something.				
Related Lessons				
Name of the Lesson	Subject	Relationship to the Lesson		
Counting in tens	General education - Primary school - First grade - Second semester – Mathematics – Patterns of numbers - Counting in tens	Counting banknotes with a value of 10		
Jump counting: twos, fives, tens	General education - Primary school - First grade - Second semester – Mathematics – Patterns of numbers - Jump counting: twos, fives, tens	Counting banknotes using Jump count		
Money (1 riyal, 5 riyals, 10 riyals)	General education - Primary school - First grade - Second semester – Mathematics – Money - Money (1 riyal, 5 riyals, 10 riyals)	Determine the value of banknotes		
Counting money	General education - Primary school - First grade - Second semester – Mathematics – Money - Counting money	Counting banknotes of different values		
First objective	Finding the value of a set of banknotes to judge the possibility of purchasing something			
Suggested time		45		
Objective level				

