EXAMINING THE EFFECTIVENESS OF USING POINT-OF-VIEW VIDEO MODELING ON MATHEMATICS IMPROVEMENT IN STUDENTS WITH LEARNING DISABILITIES IN SAUDI ARABIA

Tirad Alsaluli

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EXAMINING THE EFFECTIVENESS OF USING POINT-OF-VIEW VIDEO MODELING ON MATHEMATICS IMPROVEMENT IN STUDENTS WITH LEARNING DISABILITIES IN SAUDI ARABIA

A Dissertation
Submitted to the School of Education

Duquesne University
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By
Tirad Alsaluli

August 2023
EXAMINING THE EFFECTIVENESS OF USING POINT-OF-VIEW VIDEO MODELING ON MATHEMATICS IMPROVEMENT IN STUDENTS WITH LEARNING DISABILITIES IN SAUDI ARABIA

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ABSTRACT

EXAMINING THE EFFECTIVENESS OF USING POINT-OF-VIEW VIDEO MODELING ON MATHEMATICS IMPROVEMENT IN STUDENTS WITH LEARNING DISABILITIES IN SAUDI ARABIA

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Tirad Alsaluli

August 2023

Dissertation supervised by Dr. Reva Mathieu-Sher

Video Modeling (VM) is one of the most widely used approaches by researchers to improve many skills, such as academic skills in students with Learning Disabilities (LD; Boon et al., 2020). As the incidence rate of individuals with LD in Saudi Arabia increase (Almedlij & Rubinstein-Ávila, 2018), the need for evidence-based math interventions focused on the math development of individuals with LD also increases. Although VM is recognized as an Evidence-based Practice (EBPs), a limited number of studies have implemented VM as an intervention to improve mathematic skills. Implementing VM as a math intervention strategy would explore its effects on math skill improvements in students with LD in Saudi Arabia. This single-subject multiple baseline study aims to evaluate the effectiveness of an intervention that uses Point-of-View Video Modeling (POV-VM), a VM method, to improve addition focused math skills for elementary students with LD in Saudi Arabia.
Keywords: video modeling, point-of-view video modeling, mathematics, addition, learning disabilities, Saudi Arabia
DEDICATION

This dissertation is sincerely dedicated to my parents, brothers, and sisters, who have been the source of my success. I extend my gratitude to my parents (Mohammed and Fatima) for their prayers, help, and support throughout my life, and my brothers and sisters for their constant encouragement.

Additionally, this dissertation is deeply dedicated to my life partner (Amirah Alhutayl). Thank you for your patience, endurance, and your continued support to finish what I started. I also dedicate this dissertation to the source of my happiness, my children, Mohammad and Fayez.

Finally, I dedicate this dissertation to the government of the Kingdom of Saudi Arabia and Najran University. Thank you for believing in me and giving me a full scholarship for language, master, and doctoral degrees. Thank you for your financial support, which facilitated my academic journey during my scholarship.
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Chapter One

Introduction

Education is an essential human virtue, a basis of a good life, and a necessity of society (Bhardwaj, 2016). But some individuals require additional or supplemental education in order for them to make adequate progress in their lives. Therefore, special education services are provided. These services are a specialized branch of education in many settings, such as classrooms, homes, and institutions, to help these students become successful and self-sufficient members of the community. Special education is specially designed instruction to meet the unique needs of a child with a disability, at no cost to the parents (Individuals with Disabilities Education Act [IDEA], 2004). Individuals who receive special education program services must be among the categories included under the Individuals with Disabilities Education Act (IDEA, 2004). One of these categories which the researcher in this study will focus on is the categories of Learning Disabilities (LD). According to IDEA (2004), LD is defined as a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

(para. 1)

One of the common difficulties that students with LD face in schools is mathematics evidenced by performing below grade level (Billingsley et al., 2009) based on national level assessment. Approximately only 38% of students without disabilities scored at or above the proficient level in mathematics, and when looking at children with disabilities, this number dropped even further
to 9% scoring at or above the proficient level (National Assessment of Educational Progress [NAEP], 2017). The last assessment conducted by NAEP (2019) reported that there was no change in mathematics scores for most students compared to the previous assessment in 2017. More specifically, approximately 6-14% of students with LD struggle with math skills (Zhang et al., 2019). These statistics indicate that a large percentage of students with disabilities such as LD struggle with mathematic skills (Soares et al., 2018).

A key area to success in life is learning basic math skills because they are routinely utilized in our society. It is important that children begin to learn math well before entering kindergarten, and it is a required element of the school curriculum well into high school (Moursund, 2005). Students must learn the concept of basic operations, followed by fact memorization, and the ability to respond accurately and quickly to various facts. Without these foundational skills, it becomes more difficult for children to build upon these basic skills and achieve mastery of higher-level math concepts (Erbey et al., 2017). Students with disabilities, such as LD can experience difficulties with a procedural and conceptual understanding of various mathematic concepts across grade levels (Agrawal & Morin, 2016). These difficulties may hinder a student from achieving the skills required to succeed in school.

Education legislation and policies have confirmed the government’s commitment to evidence-based practices (EBPs) (Horner et al., 2005). EBPs refer to practices that have shown to be successful through scientific research (Odom et al., 2005). The federal government created a "What Works Clearinghouse" to provide EBPs for other organizations, such as policymakers, researchers, teachers, and the public. The source offers easy access to high-quality research on different programs, practices, products, and policies in education for parents, teachers, and school administrators (Whitehurst, 2002). EBPs have advanced significantly to create more
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effective educational programs and have achieved improved results for students with disabilities (Cook & Odom, 2013). One of the EBPs that was created and proven effective among students with certain disabilities (e.g., LD) was Video Modeling intervention (VM), which can teach and improve many academic and behavioral skills such as math for all ages in school (Wright et al., 2020).

An intervention in education is a particular program or set of steps an educator takes to achieve the target task/behavior (Lynch, 2019). These interventions are methods for children to receive additional instructional time to close the educational gap with their peers in the classroom who perform at higher levels (Gilpin, 2014). The intervention can be done in a single group setting or a small group that allows for more in-depth instruction on the material being presented, so a child can acquire a better understanding of the presented material. One of the most effective interventions is VM (Gilpin, 2014).

VM is a video recording of instruction utilizing explicit and systematic instruction and then exhibiting the video clip to a child before they complete the desired behavior or task (Cooper et al., 2019). For example, a student with LD can watch a video showing a skilled person solving math problems step by step, such as addition or subtraction. After watching the video, a student can follow what they saw, then solve the math problem correctly (Yakubova et al., 2016). The results of a study conducted by Bellini and Akullian (2007) indicated that VM interventions have proven successful in developing vocational skills, social communication skills, play skills, academic skills, and functional/daily living skills (Blum-Dimaya et al., 2010; Charlop et al., 2010; Cihak & Schrader, 2008; Hughes, 2019; Wynkoop et al., 2018). VM was derived from social learning theory, in which people are believed to learn and gain behavioral
skills through observation (Bandura, 1961). VM intervention is now well-documented in the fields of both learning and behavioral sciences (Corbett & Abdullah, 2005).

There are four types of VM interventions, which are: (1) Point-of-View Video Modeling (POV-VM); (2) Basic Video Modeling (BVM); (3) Video Prompting (VP); and (4) Video Self-Modeling (VSM) (Kellems & Edwards, 2015). For the POV-VM, which will be implemented in this study, the camera angle is positioned at the student's eye level and depicts just what the student might see in the context of the skill being taught (from her or his own viewpoint). Depending on the skill being taught, the student might view a specific setting or a pair of hands to complete a task (Tetreault & Lerman, 2010). For instance, a student will see a video of a competent model's hands performing addition problems using regrouping step by step. The four types of VM have been used and proven successful in teaching some desired tasks/behaviors for disabilities, such as social communication skills, academic skills, vocational skills, play skills, and functional/daily living skills among students with disabilities (Blum-Dimaya et al., 2010; Charlop et al., 2010; Cihak & Schrader, 2008; Hughes, 2019; Wynkoop et al., 2018).

Among the studies in which VM has been applied to develop mathematics skills among students with LD, no one of the studies used any type of VM to teach students with LD in elementary school. To solve this gap, researchers should implement VM interventions to improve mathematics in students with LD in elementary school. Due to the absence of any study that utilized POV-VM intervention to develop the mathematic skills for elementary students with LD in the Middle East, the current study will be implemented in Saudi Arabia (KSA).

**Saudi Arabia Overview**

KSA is a country located in the Middle East bordering the Arabian Gulf and the Red Sea (Global business knowledge, 2020). KSA is the center of Islam and the place of the two holiest
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cities in Islam (Makkah and Madinah); therefore, KSA has a significant role in the Islamic world (World Factbook, 2022). The Ministry of Education (MOE) is the primary educational institution in KSA, in which all decisions regarding education are made. It funds universities and schools and sets education policies and standards for teacher recruitment (World Education Services, 2020). MOE formulated a plan that contained special education services in the 1960s (Bin Battal, 2016). Since then, the government has provided funding to the Special Education Department of the MOE to improve the standard of special education in all KSA cities (Alquraini, 2011). KSA is among the developed countries in the Middle East in publishing research to develop the field of special education (Alqahtani et al., 2021), but there is no study that used the VM to teach mathematic skills to students with LD. Therefore, the current study will be applied in KSA.

Areas of Concern

The majority of school-age children who receive special education are students with LD (National Center for Education Statistics, 2022). Approximately 6-14% of these students suffer in mathematical skills (Al-Salahat & Saleem, 2020; Zhang et al., 2019). Mathematical skills (e.g., addition skills) are considered a large obstacle facing students with LD in KSA (Al-Salahat & Saleem 2020; Al-Shami, 2016).

Proficiency in mathematics is essential both in the real-world and academic success, such as in the science, technology, engineering, and math fields (Kellems et al., 2016; Soares et al., 2018). Despite the importance of having strong mathematical skills, there is a large discrepancy between the math proficiency levels of individuals without disabilities and their peers with LD (Kellems et al., 2016; Berry & Powell, 2020; Rotem & Henik, 2020).

Significance of the Problem

In order to address the difficulties in mathematics of students with LD, it is crucial to
implement interventions that have already proven effective for teaching mathematics skills. A systematic review conducted by Boon et al. (2020) stated that students with LD benefited from VM in teaching math skills. Unfortunately, these interventions were only implemented to teach just certain math skills (e.g., algebra, fraction, and geometry) in the middle, high, and post-high schools. Currently, no studies have implemented VM in students with LD to improve the computation-based math skills (e.g., addition skills) in elementary school (Billingsley et al., 2009). The implementation of this study is essential to assess the effectiveness of the VM in developing mathematics skills for children with LD in elementary school.

Theoretical Basis for the Study

The proposed study will be based on Bandura's Social Learning Theory (SLT) (1977). The SLT was established in 1977 by Albert Bandura, which proposes that both modeling and observation play a fundamental role in how individuals learn (Bandura, 1977). Bandura advocated that skills can be learned by watching and imitating others. He also argues that new experiences and behaviors are attained through observing others in the immediate environment (Bandura, 1977).

The SLT provides the foundational basis for this study by supporting the argument that observational learning through VM is suitable for teaching academic skills to children with LD (Boon et al., 2020). In the SLT, Bandura claimed that when a person watches someone else execute a task and efficaciously accomplish it, it is likely to have an affirmative influence on the self-efficacy of the observer (Bandura, 1977). This, in turn, could result in an enhanced likelihood that the person observing will depict the similar behavior more frequently in the future (Cihak et al., 2014).

Bandura’s SLT (1977) comprises the four principles/steps required to facilitate
Observational learning: (a) attention; (b) retention; (c) reproduction; and (d) motivation.

Observational learning is a vital component of the social learning theory. Bandura helped to set the stage for the use of VM as an intervention to bring about a positive change to an individuals’ knowledge and behaviors.

**Relevant Literature of the Current Study**

VM is recognized as an evidence-based intervention and has shown effects on improving the mathematic skills of students with LD (Boon et al., 2020). Among the studies in which VM has been applied to develop mathematics skills among students with LD, three studies used the POV-VM type (Hughes, 2019; Morris et al., 2021; Yakubova et al., 2020). These studies used the POV-VM type, which is the type that will be applied in the current study, and also were used to improve mathematical skills in students with LD.

A study conducted by Hughes (2019) took place in a public school using a single-subject design. The participants in the study included three students between 10 and 14 years of age. The study evaluated the effectiveness of POV-VM in improving simplified fractions to students with LD. The independent variable was POV-VM. The dependent variable was a measure that had five fractions with values less than one and not in the simplest form. The results indicated that all participants not only exhibited mastery of the skill, but also maintained the skill several weeks after the implementation of the intervention phase.

More recently, Yakubova et al. (2020) conducted a study to examine the effects of using POV-VM on solving fractional computations. The participants included three middle school students. One participant was diagnosed with Autism (ASD), and two students were diagnosed with both ASD and LD. The researcher performed the POV-VM to teach the addition of fractions and subtraction of fractions. All the participants improved in solving fraction problems
when using the POV-VM intervention. The mean accuracy of fraction problem solving for all participants was 88%, 100%, and 100%. In addition, two participants generalized the skills required to solve whole proper fraction problems for the generalization phase.

More recently, a study by Morris et al. (2021) examined the effects of combining POV-VM, augmented reality, and explicit instruction to teach math skills to children with LD and ASD. The participants were between 14 and 15 years old. A multiple baseline design was employed in this study. The researchers delivered explicit instruction via POV-VM accessed via an augmented reality mobile application. This study was implemented to teach students four mathematic skills: adding fractions, calculating perimeter, calculating the range of a set of digits, and calculating the mean of a set of digits. The results of the study showed an increase in all students' performance across the four skills when using POV-VM, and all students maintained the four skills during the maintenance phase.

According to the results of the studies conducted by Hughes (2019), Morris et al. (2021), and Yakubova et al. (2020), POV-VM is an effective intervention to improve the mathematic skills of students with LD in middle school. The positive results of these studies gave the researchers an incentive to investigate more about the impact of POV-VM interventions on developing the other mathematic skills of students with LD in different grade levels. Due to the effective results of the studies by Hughes (2019), Morris et al. (2021), and Yakubova et al. (2020) when using POV-VM to develop math skills for students in middle school, this study will be expanded to apply POV-VM intervention to develop the addition skills in students with LD in elementary school.
Problem Statement

Mathematics difficulties are one of the academic problems facing students with LD in schools and represent a significant gap in terms of proficiency (Geary, 2004; Mulcahy et al., 2014). Therefore, evaluating and discovering effective strategies for developing the skills of students with LD in mathematics is paramount. A VM strategy is one of the strategies proven effective for teaching and improving several skills, such as social skills among students with disabilities (Charlop et al., 2010). However, there are only a few studies in which VM has been applied to develop academic skills such as mathematics for students with LD. Therefore, the implementation of this study is essential to know the extent of the effectiveness of the POV-VM, a VM method, to develop mathematics skills for students with LD, especially in countries that have few studies such as KSA. To achieve this goal, the current study will examine the effectiveness of using POV-VM on elementary students with LD to improve addition skills in KSA.

Research Questions

The following research questions will be addressed in this study:

RQ1: Does POV-VM intervention develop increased proficiency in solving addition problems with regrouping for values under 100 in students with LD in KSA?

Hypothesis: Yes, POV-VM intervention will develop increased proficiency in solving addition problems with regrouping for values under 100 in students with LD in KSA.

RQ2: Do students retain math skill improvements (addition with regrouping for values under 100) after the POV-VM intervention is removed?

Hypothesis: Yes, students will be able to retain math skills gained (addition with regrouping for values under 100) after the POV-VM intervention is removed.
Chapter Two

Literature Review

Overview

The first portion of this chapter will be a more detailed discussion about KSA, including history and education system as the current study will be applied in KSA. The second portion of the chapter will be a literature review of LD and VM interventions focused on improvement of mathematic skills of students. This review will be executed to evaluate the effectiveness of using Point-of-View Video Modeling (POV-VM) for children with LD to define its suitable implementation in KSA. In addition, this review will determine the gaps that necessitated the current study.

Saudi Arabia

History and Education System of Saudi Arabia

The KSA was officially established circa 1932. On the west of the Asia continent, where it borders Egypt and the Red Sea, lies KSA. The country was poor. It had just 12 schools servicing 700 children. In 1938, this situation changed in a big way when a lot of oil was found in KSA. Therefore, more schools were established, with 365 schools by 1950 (Alamri, 2011). All educational levels in KSA have been separated between males and females since the educational system's establishment (Alquraini, 2013). In 1954, the MOE was established.

All educational institutions, either private or public must follow regulations and standards established by the MOE (MOE, 2021). The MOE falls under the education sector, whose main task is to ensure schools run smoothly. MOE makes education policies and regulate the national curriculum (Aldabas, 2015). MOE also regulates universities’ education and the Technical and Vocational Training Corporation (MOE, 2022). The MOE funds all educational levels making it
free to all students. The educational levels in KSA are as follows: (a) kindergarten; (b) elementary; (c) middle school; (d) high school; (e) university; and (f) postgraduate (Al-Kahtani, 2015).

In the 1960s, the MOE formulated a plan that incorporated special education services (Bin Battal, 2016). The main categories served first were students with deafness, blindness, and mental retardation (Afeafe, 2000). After this movement, special education services were improved, such as providing qualified people to serve individuals with disabilities and establishing special rehabilitation centers. In 1996, the MOE has started to serve the other categories of disability such as LD, multiple disabilities, and autism. Since that time, the government has supported the Special Education Department in the MOE with money to increase the quality of special education throughout the cities of the KSA (Alquraini, 2011). During the development of the establishment of special education centers and diagnostic centers, many students were diagnosed as falling under the category of people with disabilities. For instance, the number of individuals with disabilities who were diagnosed in 2007 was 3,130 (Alquraini, 2011), compared to the last survey in 2017, which was 1,445,723 (General Authority for Statistics, 2019). The number of students with LD is more than 500,000 (King Salman Center for Disabilities Research, 2018).

**Special Education Background**

Special education is a designed instruction to meet the unique needs of an individual with a disability without any cost to the parents (IDEA, 2004). To be covered under IDEA, a student's performance in school must be adversely affected by a disability in one of the 13 categories. According to IDEA (2004), the categories are (1) ASD; (2) emotional disturbance; (3) other health impairment; (4) speech or language impairment; (5) visual impairment; (6) deafness; (7)
hearing impairment; (8) deaf/blindness; (9) orthopedic impairment; (10) intellectual disability; (11) traumatic brain injury; (12) multiple disabilities; (13) LD. The LD impacts a child's ability to write, read, reason, listen, speak, and solve math calculations. The LD is the focus of the study.

**Learning Disabilities Category**

During the 1950s, individuals with disabilities and their families were fighting for their rights. There was no special term for a student who was underachieving in school. Underachievement was used to describe students who had word blindness, dyslexia, dysgraphia, and dyscalculia. "underachieving children couldn’t receive special education unless they were mentally deficient, emotionally disturbed, or physically handicapped" (Lyon & Fletcher, 2006, p.1). After the movement of fighting for the rights for people with disabilities, the federal government with some support from family advocacy associations began to take steps to raise the quality of services provided to people with disabilities in the 1960s.

In 1962, Samuel Kirk, a well-renowned psychologist at the University of Illinois, coined the term “learning disabilities.” Since then, the term learning disabilities (LD) has become officially recognized in the education community. Kirk (1962) defined LD as a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, spelling, writing, or arithmetic resulting from a possible cerebral dysfunction and not from mental retardation, sensory deprivation, or cultural or instructional factors. (Kirk, 1962, p. 263)

There are many definitions used for LD around the world. One of the primary sources that provide an official definition of LD in most countries of the world now is IDEA. According to IDEA (2004), LD is defined as a
disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

(para. 1)

LD can be caused by several factors, including genetics, inherited causes, environmental factors, co-morbid disorders, and brain injury (Al-Dababneh & Al-Zboon, 2018; Aquil & Ariffin, 2020; Chordia et al., 2020). There is not specific consensus in the field specific to a definite or sole cause of LD (Chordia et al., 2020). Inherited causes occur when specific genes are passed from the parents to affect the development of the brain (Aquil & Ariffin, 2020). LD can also be caused by illness during and after birth or even a mother consuming alcohol during pregnancy, prolonged/premature labor, low birth weight, and physical trauma, or development of the brain (Al-Dababneh & Al-Zboon, 2018; Harfiani & Akrim, 2020; Wang et al., 2020; Zasler & Bender, 2019). Some researchers argue that the causes of LD in some children are cognitive dysfunctions or biologically based cognitive deficits that impede their sufficient acquisition of essential academic skills (Büttner & Hasselhorn, 2011). Nevertheless, it is hard to empirically determine those causes.

Learning Disabilities in Saudi Arabia

The educational system in KSA has been mostly modeled off the educational system in America (Alnaim, 2015). This greatly helped the Ministry of Education (MOE) in knowing the correct definition of each disability, such as LD. Therefore, The MOE took the LD definition from IDEA with the following minor modifications:
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Disorders in one or more of the basic psychological processes involved in understanding or using spoken and written language which are manifested in disorders in listening, thinking, talking, reading, writing, spelling, or arithmetic and are not due to factors related to mental retardation, visual or hearing impairments, or educational, social, and familial factors (MOE, 2013, p. 23)

In KSA, all students are expected to be provided with adequate access to academic services and programs. Local disability laws mandate institutions adapt their curriculum and support the students with special needs, ensuring equal opportunities for people with disabilities (Abed and Shackelford, 2020). After the financial support from the government to the MOE to raise the services provided to people with disabilities, KSA’s MOE proceeded with the inclusion of the LD into the list that makes a student eligible to receive special education services in 1996; until recently, the prevalence of this category equaled 33% of identified students (Almedlij & Rubinstein-Ávila, 2018). Hence, the LD in KSA officially started to be served in the second half of the nineteen nineties.

For the following decades, special education services in the KSA have been consistently honing their educational services for individuals with disabilities. It allows the KSA to advance as a regional leader in implementing LD learning approaches. The government has encouraged and invested in the education sector to assure that all students, regardless of their gender, age, and racial affiliation, can receive a free and adapted education (Alqraini, 2011).

Learning Disabilities and Academic Challenges

Children with LD often have difficulties in different areas of academic performance (Grigorenko et al., 2020). Reading, math, and writing are the academic areas where students with LD have difficulties in school. Some students have problems in just one area of these academic
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skills, while others may have difficulties in all of these academic skills (Grigorenko et al., 2020). When a child has a reading-related difficulty and has been diagnosed with LD, this disability is called dyslexia. Dyslexia is associated with language-based processing skills responsible for processing language being affected. It occurs when the student is not in a position to identify reading sounds or decode them to form words. Dyslexia interferes with not only reading sounds and decoding but also spelling (Berninger & Wolf, 2016). When a student has a writing-related difficulty, and has been diagnosed with LD, this disability is called dysgraphia. Dysgraphia influences an individual's fine motor skills and handwriting ability. LD affects the writing abilities of an individual but can also be noticeable with challenges in poor handwriting, spelling, and arranging thoughts on paper. Dysgraphia is also characterized by inconsistent words and letter spacing, frequent erasing, poor spatial planning, and cramped grip of the writing utensil (Chung, Patel, & Nizami, 2020). Dyscalculia is a LD related to math. These students have problems with understanding math related concepts and tasks. Children with dyscalculia find it challenging to do fundamental math problems, and this problem can continue as they grow to be adults. They also find it challenging to understand numbers and learn math facts (Cortiella & Horowitz, 2014). This study focuses specifically on student’s addition skills.

 Addition skills

Addition is an operation in mathematics that involves the summation of two or more numbers. In addition, numbers can be arranged horizontally or vertically. Students with LD encounter several challenges in performing addition operations. Students treat each column as a separate issue, thus giving wrong answers. Secondly, the students with LD fail to reorganize numbers when adding due to poor comprehension. The other challenge is adding tens and hundreds across the row (regrouping) but failing to do it correctly. There is also the poor
alignment of numbers which results in wrong answers. Students with LD fail to conduct simple addition manipulations. Lastly, such students tend to submit incomplete work where some values are not added together. The challenges are contributed by their poor comprehension of math symbols and the organization of numbers (Mundia, 2012).

Addition with Regrouping

Addition with regrouping is the specific skill that the researcher will use in this current study. Addition with regrouping has proven to be effective procedure in teaching addition skill to students with LD (Carmack, 2011). Addition with regrouping is a column method of summation used to solve mathematical problems involving two or more numbers having different place values (Newton, 2018). Addition begins on the ones place value column, which is usually on the farthest right. When the sum on that particular column is more than 9, a value is carried to the tens place value. The digits in the second column are added, and if the sum is ten or more, regrouping takes place. The exact process is repeated until a solution is obtained. For instance, the correct answer to 24+19 is 43. The solution is found as follows.

\[
\begin{array}{c c}
\text{Tens} & \text{Ones} \\
2 & 4 \\
+ & 1 \\
\hline
4 & 3 \\
\end{array}
\]

First, the values in the ones place value, the first column on the right, are added. The sum of 9 and 4 is 13. However, since the value has 3 ones and 1 tens, 3 is written on the third row, and 1 is carried to the tens place value. Further, adding 1, 2, and 1 in the second column gives a value of 4. The sum of 24 and 19, therefore, becomes 43.
Theoretical Frameworks

Social Learning Theory (SLT) is the theoretical model that informs this research. Bandura made VM prevalent through his SLT (Bandura, 1977). Since then, VM has been demonstrated to be an effective intervention in different types of settings and with a variety of students, including those with a LD. As such, researchers have found VM to be an effective research-based intervention for instructing students with a LD (Boon et al., 2020; Satsangi, 2019a, 2019b; Kellems, & Edwards, 2016). Moreover, Kellems and Edwards (2016) stated that teachers have been utilizing VM to teach academic skills to students with LD.

Similarly, SLT is relevant in this research because VM utilizes the concepts of SLT wherein people are assumed to acquire skills via relayed and observation fortification (Bandura, 1977). In other words, the VM intervention for teaching academic skills to children with disabilities was derived from Bandura’s SLT. According to Bandura, VM contains the crucial components of self-efficacy. This makes VM an effective intervention for teaching skills to challenging populations, including students with disabilities, as a teaching intervention (Baker et al., 2009).

VM exemplifies the SLT since the students can attain the modeled skills by observation. Moreover, video-based intervention focuses on explicit instruction, which gives the students accurate, clear, and concise directives for a target task (Clinton et al., 2016). Therefore, VM can intensify the academic skills of students with LD. Boon et al. (2020) ascertain that VM can be used as a learning tool by instructors to differentiate teaching to support students with LD in the classroom.

There are four crucial processes facilitating observational learning including attentional, retention, reproduction, and motivation. Under the attentional processes, Bandura (1977) argues
that even though individuals can learn through observation, they have to attend to and distinguish the vital structures of the model’s behavior. Learning by an example is apprehensive with attentional processes. For example, a child pays attention to video clips showing a teacher solving math problems. Retention processes are about how well the observer remembers the behavior/task. This means that the observer ought to develop a memory of the behavior to be replicated later. For example, after watching the video, the child attempts to recall the activity he saw in the video. The child might not be persuaded by observing the behavior of a model if he has no memory of it (Bandura, 1977).

Reproduction is an important process that facilitates observational learning because it gives the observer the ability to carry out the behavior that the model in the video has demonstrated. For observers to accomplish behavioral reproduction, they ought to position themselves together with a particular group of responses as per the modeled patterns. For example, after watching a video of a teacher solving a math problem, the child attempts to practice solving other similar problems after some guidance. The volume of observational learning an individual can display behaviorally depends on whether or not he attained the component skills. Lastly, the motivational process, which is the capacity of the observer to carry out the behavior that the model has demonstrated. According to Bandura (1965), by giving observers positive incentives, it is possible to translate observational learning into action. For example, the child is motivated to solve more math problems after watching the video clip. Researchers have conducted studies providing evidence that VM supports the crucial processes recommended by Bandura (Muro & Jeffrey, 2008).
Applied Behavior Analysis

Applied behavior analysis (ABA) is a systematic approach that can be utilized to understand and improve human behavior (Cooper et al., 2019). ABA is used to teach changes in behavior by utilizing reinforcement in the structured and natural environment to help children learn new skills (Buchanan & Weiss, 2010). Thus, ABA uses behavior analytics to enhance socially vital behaviors. Thus, it is an intervention that can help individuals with and without disabilities learn and change behavior (Leaf et al., 2017). This systematic approach possesses a long-standing history and evidence of its effectiveness in expediting behavioral change has been documented (Keenan & Nikopoulos, 2006). It helps to tailor interventions for each individual based on the objectively defined behaviors they depict that are measurable and observable; hence it is well thought-out as an evidence-based practice approach for children with disabilities (Rulison, 2018).

There is a strong link between ABA and VM. The VM uses ABA to enhance special skills for parents and their children with disabilities (Bagaiolo et al., 2017). VM is one of the best teaching methods used in ABA to give students a visual model of the target behavior/skill they need to learn (Wahoski, 2015). Bagaiolo et al. (2017) acknowledge that VM is highly effective because it’s not costly and requires less time for training and implementation. Teachers can use VM in the ABA teaching method by videotaping the targeted behaviors that the child is required to learn. The child is given the video to watch and time to memorize, imitate, and generalize the targeted behaviors/tasks. Thus, VM is a well-established instructional strategy in ABA for children with disabilities, such as LD.
Video Modeling

VM intervention involves the participants watching videotapes and recordings of individuals such as peers, adults, or themselves engaging in a positive behavior or a skill being taught (Haring et al., 1987). Currently, VM is more commonly used by researchers than teachers in schools (Marino, 2015). There are many websites and apps available to show a teacher how to create an effective video, but it is yet to have reached its fullest potential in classrooms. For example, when an educator wants to teach a math skill (e.g., addition with regrouping) to a student with LD, the educator will ask the student to watch an instructional video showing how to do addition with regrouping because the students will learn those skills after watching the video (Hughes, 2019).

A VM intervention can be created by teachers or practitioners via hand-held or micro video cameras, traditional video cameras, or digital cameras. According to LaCava (2008), there are steps to create an appropriate VM for the student: (a) determine the target task, for example, addition with regrouping (b) determine an appropriate type of VM, for example, POV-VM; (c) edit the video by removing any errors and/or prompts or added cues (beyond naturally occurring cues); and (d) if necessary, complete voice-overs which could include narration of the steps. Students can play back the video that teachers or practitioners created via their own devices (LaCava, 2008). While VM has proven to be useful to improve behavioral skills, it has recently proven to be effective in increasing the acquisition of academic skills. VM can be utilized to increase students’ skill levels successfully in core academic areas such as mathematics (Kellems & Edwards, 2015).
Variations of Video Modeling

VM intervention is not limited to a single approach. All approaches to VM have proven successful in providing instruction to children with disabilities. The types of VM intervention include Point-of-View Video Modeling (POV-VM), Video Self-Modeling (VSM), Basic Video Modeling (BVM), and Video Prompting (VP) (Kellems & Edwards 2015). When specifying which type of VM intervention to utilize, educators need to consider the skill being taught, including the duration and complexity of the skill and the characteristics of the child, such as the child's working memory or attention span. For example, if the targeted skill is complex and has many steps and the teacher feels that these steps need to be broken down, then VP intervention has proven to be a more effective intervention in under these circumstances (Kellems & Edwards, 2015).

The first type of VM is the POV-VM. For this type, the camera angle is shown at the child’s eye level and shows only what the child might see within the context of the targeted skill (from her or his own viewpoint). Depending on the targeted skill, the child might view a specific setting or a pair of hands to complete a task (Tetreault & Lerman, 2010). For example, a child will watch a video of a skilled model’s hands solving step-by-step the addition problems with regrouping.

The second type is VSM. This type requires the target student to video himself/herself and then observe himself/herself implementing a task or engaging in the skill on the video. When this intervention is applied, a student is typically prompted to engage in certain behaviors at suitable times or respond to suitable stimuli. Then, those prompts are edited from the video before the video is shown to the student for modeling (Marcus & Wilder 2009). For example, practitioners/teachers record a video of target student doing the steps of solving the addition with
regrouping, so the target student will watch himself/herself doing the targeted task (solving the addition with regrouping).

The third type is BVM. This intervention involves the participant watching a video of an actor other than himself/herself appropriately performing a specific skill. For example, practitioners/teachers record a video of skilled model doing the steps of solving addition with regrouping. This intervention aims to target a change in a child's current behavior/task and assist in improving his/her ability to perform the skill successfully (Murray & Noland, 2012).

The fourth type is VP. For this type, a video is broken down into several clips. A student watches one clip of a specific task and then the student is prompted by the teacher to implement the step shown (Kellems & Edwards, 2015). For example, the practitioners/teachers break down steps in undertaking task analysis for addition problems with regrouping strategy in various clips so that the student can watch someone skilled in solving the addition problems with regrouping technique in several clips.

The conditions for knowing which type and delivery of VM intervention to utilize will depend on the child's individual needs. It is essential that the instructors know their students to decide which type of VM intervention is the best for each student. For example, a teacher wants a student to learn a math skill which he has difficulty. At the same time, the teacher does not want the student to be distracted while watching the video because the student has a behavioral problem which is a distraction. In that case, POV-VM is the most appropriate VM approach as Hughes & Yakubova. (2016) recommended implementing it because it has been proven that its use effectively teaches mathematics skills, and it aims to minimize external stimuli that affect the student's attention (Hughes & Yakubova, 2016).
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Advantages of Video Modeling

The VM intervention has proven to be useful to improve many skills such as the academic skills of students with disabilities. It also has some advantages that make researchers, teachers, and parents apply the VM intervention for children with disabilities. VM is convenient and can be used in a wide array of settings. It can be used as an intervention at home or in independent and group centers, making it particularly helpful and easy to use. Parents and paraprofessionals can also be trained to use VM intervention (Merrill & Risch, 2014). A study by Besler and Kurt (2016) found that VM intervention that was provided by mothers was effective to help their children to acquire play skills. After the intervention was over, they maintained the skill and generalized it to various settings and people.

As supported by the results of the study by Besler and Kurt (2016) and a study conducted by Delano (2007), VM intervention has been used because it has a high degree of generalizability across settings and participants. Generalization is significant because it increases the likelihood that the students will be successful in completing a behavior/task independently in different settings (Cooper et al., 2019). For example, a study conducted by Satsangi et al. (2020a) indicated that all participants generalized the math skills gained after intervention phase.

In addition to high generalizability, there is also a high degree of maintenance of the skills learned through this intervention. Maintenance occurs when a behavior/task continues to occur after withdrawing the intervention partially or fully (Cooper et al., 2019). For students with LD, this benefit is particularly helpful. Maintaining skills is essential to building upon them to develop new skills, especially when learning mathematics.

VM intervention has proven to be an enjoyable technique for children with disabilities. A study by Hadadi (2018) indicated that while implementing the intervention, participants
expressed pleasure when watching the VM. Also, a study by Yakubova et al. (2020) indicated that participants enjoyed the VM interventions in the study sessions; therefore, the percentage of skill acquisition increased, and they achieved the targeted skill.

Current Empirical Literature Relevant to the Study

Method of the Literature Review

Research articles were located using three electronic databases to ensure a thorough review of the literature was completed: Education Resources Information Center [ERIC], ProQuest, and PsycINFO. To ensure that all related terminologies were included, the following keywords were used in research procedures (“video modeling” or “point-of-view video modeling” or “video self-modeling” or “basic video modeling” or “video prompting” and “academic skills” or “math skills” and “learning disabilities” or “students with disabilities”).

Inclusion Criteria

For inclusion criteria in this literature review, the studies had to: (a) implement VM alone or be paired with other strategies, (b) include students with LD, (c) utilize a single-subject research design, (d) use a math skill as one of the dependent variables, (e) include K-12 and secondary students, and (f) be implemented in any country. Studies were excluded if it was published as a literature review or meta-analysis.

The Analysis of the Eleven Studies

Eleven VM intervention studies including students with LD were selected that met the inclusion criteria. All studies implemented VM interventions to improve mathematic skills in students with LD. The findings from the literature review suggested that VM intervention is an effective tool for teaching mathematic skills to children with LD from middle school to post-high school (Billingsley et al., 2009; Cihak & Bowlin, 2009; Edwards et al., 2020; Hughes, 2019;
Kellems et al., 2016; Morris et al., 2021; Satsangi et al., 2019a, 2019b, 2020a, 2020b; Yakubova et al., 2020).

**Participants**

For each of the 11 studies, there were either three, four or five participants, except two studies which included nine and ten participants (Billingsley et al., 2009; Kellems et al., 2016). A total of forty-seven participants across all studies were included in the review. The participants were between 11 and 21 years of age (23 girls and 24 boys). Of the participants, 34 were diagnosed with LD (Billingsley et al., 2009; Cihak & Bowlin, 2009; Edwards et al., 2020; Hughes, 2019; Kellems et al., 2016; Morris et al., 2021; Satsangi et al., 2019a, 2019b, 2020a, 2020b; Yakubova et al., 2020). In addition, five participants were diagnosed with ASD (Kellems et al., 2016; Morris et al., 2021; Yakubova et al., 2020), four students with ID (Kellems et al., 2016), three participants were diagnosed with emotional and behavioral disorder, and one participant with OHI. The participants were drawn from middle school to post-high school. Eight participants were from middle school (Hughes, 2019; Morris et al., 2021; Yakubova et al., 2020), 30 of the participants were from high school (Billingsley et al., 2009; Cihak & Bowlin, 2009; Edwards et al., 2020; Satsangi et al., 2019a, 2019b, 2020a, 2020b), and nine students from post-high school.

**Research Design**

All studies employed single-subject designs. Seven studies used a multiple probe design (Cihak & Bowlin, 2009; Edwards et al., 2020; Hughes, 2019; Kellems et al., 2016; Satsangi et al., 2019a, 2020b; Yakubova et al., 2020). Three studies implemented alternating-treatments design (Billingsley et al., 2009; Satsangi et al., 2019b, 2020a). One study used a multiple baseline design (Morris et al., 2021).
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**Intervention**

All the studies utilized either BVM, POV-VM, or VP. The BVM method was used in six studies (Billingsley et al., 2009; Cihak & Bowlin, 2009; Satsangi et al., 2019a, 2019b, 2020a, 2020b). For the POV-VM, it was implemented three times (Hughes, 2019; Morris et al., 2021; Yakubova et al., 2020). For the VP type, it was performed twice (Edwards et al., 2020; Kellems et al., 2016). Based on all the studies, it is difficult to know which the most effective type is due to the lack of studies implemented and the lack of skills targeted. One type of VM has not been included in studies (VSM), and no study has been implemented to compare two different types of VM to teach a specific skill in mathematics to determine if one type of VM is more effective than others. Overall, three types of VM interventions (BVM, POV-VM, and VP) have shown that they are effective interventions to teach math skills to students with LD.

**Intervention Agent**

In the eleven studies, the interventions were implemented either by the researchers alone or by assisting the special education teachers. In six of the studies, the intervention was administered solely by the researchers (Billingsley et al., 2009; Hughes, 2019; Kellems et al., 2016; Satsangi et al., 2019a, 2019b; Yakubova et al., 2020). In five of the studies, the intervention was administered by researchers in special education programs at the PhD level and assisted by teachers (Cihak & Bowlin, 2009; Edwards et al., 2020; Morris et al., 2021; Satsangi et al., 2020a, 2020b).

**Setting**

In one study, students completed the interventions both in school and at home (Cihak & Bowlin, 2009). For the remaining studies, the interventions were set in schools. Four studies performed the interventions in the conference room (Edwards et al., 2020; Satsangi et al., 2020a,
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2020b; Yakubova et al., 2020). In three studies, the interventions were implemented in a separate room at school (Kellems et al., 2016; Satsangi et al., 2019a, 2019b). In two studies, the researchers implemented the interventions in the resource rooms (Hughes, 2019; Morris et al., 2021). Finally, one study conducted the intervention in a self-contained classroom (Billingsley et al., 2009).

**Number of Sessions**

The number of sessions in the VM interventions varied widely across the eleven studies. For example, six studies ranged from 3-7 sessions (Cihak & Bowlin, 2009; Satsangi et al., 2019a, 2019b, 2020a, 2020b; Yakubova et al., 2020). Also, three studies included 2-10 sessions (Billingsley et al., 2009; Hughes, 2019; Kellems et al., 2016). Lastly, two studies ranged from 7-15 (Edwards et al., 2020; Morris et al., 2021).

**Maintenance and Generalization**

Of the eleven studies, seven implemented the maintenance phase (Billingsley et al., 2009; Cihak & Bowlin, 2009; Edwards et al., 2020; Hughes, 2019; Kellems et al., 2016; Morris et al., 2021; Satsangi et al., 2019a). Three studies performed the generalization phase (Hughes, 2019; Satsangi et al., 2020a; Yakubova et al., 2020). Two studies did not include maintenance and generalization post the intervention phase (Satsangi et al., 2019b, 2020b). Overall, the maintenance phases indicated that all participants retained the target skills with a range between 80% and 100%. For the generalization phases, one of three studies showed that participants generalized the skills with a range between 80% and 100% (Satsangi et al., 2020a). One study states that two participants generalized the skills with 100%, but one student got 0%. For the third study, two participants generalized the target skills with 40%, and one student got 0%.
Inter-Scorer Agreement

All eleven studies collected the inter-scorer agreement (Billingsley et al., 2009; Cihak & Bowlin, 2009; Edwards et al., 2020; Hughes, 2019; Kellems et al., 2016; Morris et al., 2021; Satsangi et al., 2019a, 2019b, 2020a, 2020b; Yakubova et al., 2020). Inter-scorer agreements were gathered through the permanent products in all studies. The inter-scorer agreement was assessed in 20% to 50% across the sessions in each study, with percentages of inter-scorer agreement ranging from 80% to 100%.

Social Validity

Ten studies performed the social validity measures. Of these, the researchers used the social validity measures for both students and teachers; the interviews were used in two studies (Cihak & Bowlin, 2009; Kellems et al., 2016), and the questionnaires were used in one study (Edwards et al., 2020). For the remaining studies, social validity measures were implemented for just students; the interviews were used in two studies (Hughes, 2019; Satsangi et al., 2020b), and the questionnaires were used in five studies (Morris et al., 2021; Satsangi et al., 2019a, 2019b, 2020a; Yakubova et al., 2020). The ten studies stated that the teachers and students had positive opinions toward the VM interventions. For example, they mentioned that the VM interventions were helpful and enjoyable.

Summary of the Eleven Studies

The eleven studies are organized and discussed below based on the type of VM. The studies implementing POV-VM are reviewed first because they are the most relevant literature (Hughes, 2019; Morris et al., 2021; Yakubova et al., 2020). The studies performing BVM are reviewed second (Billingsley et al., 2009; Cihak & Bowlin, 2009; Satsangi et al., 2019a, 2019b,
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2020a, 2020b). The studies implementing VP are reviewed last (Edwards et al., 2020; Kellems et al., 2016).

**Point of View Video Modeling**

Three studies implemented POV-VM to teach fraction skills to students in middle school. The participants in the studies included eight students between 11 and 15 years of age. Four students were diagnosed with LD, two were diagnosed with both LD and ASD, and two were diagnosed with ASD. All studies showed that all students' math performance increased after using POV-VM intervention (Hughes, 2019; Morris et al., 2021; Yakubova et al., 2020).

The study conducted by Hughes (2019) evaluated the effectiveness of POV-VM in teaching simplified fractions to students with LD. The study took place in a public middle school using a multiple probe design. The independent variable was POV-VM. The dependent variable was a measure that had five fractions with values less than one and not in the simplest form. The fractions used in each measure were chosen at random from a list.

During the interventions, the participants received a laptop, headphones, and the fractions assessment. The laptop was loaded with a video for the participants to watch independently. Upon viewing the videos, the participants were asked to solve the fraction problems independently. After two weeks of the intervention phase, the participants were given maintenance assessments. Finally, they received one generalization assessment each and were asked to read as well as solve word problems involving the simplification of fractions.

All participants received a score of 0% during the baseline phase; however, after the POV-VM intervention was implemented, a 90% mean average was recorded. In this study, the intervention proved effective. The participants showed a mastery of the skill and maintained the
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skill after the intervention for several weeks. For the generalization phase, one generalization assessment was given to each student and yielded the following scores of 0%, 40%, and 40%.

More recently, Yakubova et al. (2020) conducted a study to examine the effects of POV-VM by using concrete manipulatives combined with the practice of comprehension check and a self-monitoring checklist on fraction problem-solving. The participants included three middle school students. One participant was diagnosed with ASD, and two students were diagnosed with both ASD and LD.

A multiple probes design was implemented to examine whether there is a functional relationship between the intervention and students' success in answering simple fraction problems. The problems were subtraction of fractions and addition of fractions. The independent variable comprised various strategies: (a) POV-VM, (b) concrete manipulatives, (c) self-monitoring checklist, and (d) comprehension checks.

The researcher in the video showed how to solve a fraction using concrete manipulatives. The concrete manipulatives were applied for a hands-on demonstration and visual depiction of the task to support the children comprehend the conceptual part of problem-solving. Fraction tile manipulatives were the type of concrete manipulatives that were employed in the study. After solving the fraction problem, the researcher in the video showed how to use the self-monitoring checklist. The self-monitoring checklist comprised of the task analysis stages of fraction problem solving. After the participant watched the entire video, the researcher gave the participant a worksheet that included fraction problems to be solved and the self-monitoring checklist. While the participant completed the worksheet with the self-mentoring checklist, the researcher provided guidance as needed. This session comprised the comprehension check, which tested the
participant’s comprehension of the POV-VM content. The dependent variable in the study was the percentage accuracy of solving subtraction and addition problems utilizing proper fractions.

There were three phases: (a) baseline, (b) intervention, and (c) generalization. During the baseline phase, each student was given a task to solve a simple fraction problem without any assistance such as watching a video or instruction from the researcher. During the intervention phase, the participants have at least five sessions up to when they attained the mastery criterion of 100 percent accuracy. After that, the generalization phase was implemented to evaluate the generalization of solving simple proper fractions to solving whole proper fractions. The researcher collected the data based on the duration and accuracy.

All the participants improved in solving simple proper fraction problems during intervention sessions. The mean accuracy of fraction problem solving for all three participants was 88%, 100%, and 100%. For the generalization phase, two participants generalized the skills required to solve whole proper fraction problems.

More recently, Morris et al. (2021) conducted a study to examine the effects of combining POV-VM, augmented reality, and explicit instruction to teach mathematic skills. The study consisted of two participants, 14 and 15 years of age. One of the participants had LD, and the other had ASD. The study was conducted at a middle school. A multiple baselines design was employed to assess the intervention effects on learner performance across four mathematics skills: adding fractions, calculating perimeter, calculating the range of a set of numerals, and calculating the mean of a set of numerals. The researchers delivered explicit instruction via POV-VM accessed via an augmented reality mobile application.

The study included baseline, intervention, and maintenance phases. During the baseline phase, participants were given an assessment that consisted of the four mathematics problems.
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There was no instruction or feedback from the researcher. The researcher gave each student unlimited time to finish the assessment, and they completed it within 15 minutes. During the intervention phase, each student was asked to watch a video that showed how to solve the mathematic problems. After watching the video for each of the four skills, the students were asked to complete the assessment. Next, the maintenance phase was implemented after one week of the intervention phase. This phase used the same procedures as those used in the baseline phase (no instruction or watching a video). This phase was implemented to assess whether the students could maintain their performance.

The results indicated that all students improved in mathematics after implementing the intervention phase. The mean score for all students was 0% during the baseline phase, but the mean score for the intervention phase was 95% correct, which resulted in a 95% increase from the baseline phase to the intervention phase. For the maintenance phase, they maintained the skills with a mean score of 100%.

**Basic Video Modeling**

Of the six studies that implemented BVM intervention, one study was conducted to teach ten math skills (Billingsley et al., 2009). Three studies were conducted to teach geometry skills (Cihak & Bowlin, 2009; Satsangi et al., 2019a, 2019b). Two studies were conducted to teach algebra (Satsangi et al., 2020a, 2020b). The participants in the studies included 25 high school students between 14 and 18 years of age. 15 students were diagnosed with LD, seven were diagnosed with both LD and EBD, and three were diagnosed with EBD. All studies indicated that all participants' math performance increased after using BVM intervention (Billingsley et al., 2009; Cihak & Bowlin, 2009; Satsangi et al., 2019a, 2019b, 2020a, 2020b).
In the Billingsley et al. (2009) study, ten math functions were targeted in the interventions, such as simplification of fractions to their lowest terms, multiplying and dividing fractions, adding and subtracting fractions. Billingsley et al (2009) evaluated the effectiveness of using three different instructional methods for teaching mathematic skills to children with LD and EBD including direct teaching technique, BVM delivered through the computer, and a combination of the two methods. The study was implemented in a high school. The participants included ten students between 14 and 17 years of age. Seven students had EBD and LD and three students had EBD.

During the baseline phase, participants were provided quizzes in mathematics. Next, they were asked to answer the questions without any assistance from the researcher. The second phase was the intervention. Participants were taught the target math skills using direct teaching, BVM via computer, and a combination of both methods. Each participant was exposed to each of the instructional modalities three times in a period of nine weeks. The third phase was the best treatment. It was done to achieve extra objectives in math based on the data modalities considered most effective across all participants. The last phase was the maintenance phase. This phase used the same procedures as those used in the baseline phase (no instruction or watching a video). This phase was implemented to assess whether the students could maintain their performance.

The results indicated that the students scored higher during the phase of the combined BVM and direct teaching model for seven students. Two students earned better scores in the direct teach phase, and the last participant earned a better score in the BVM phase. In addition, all participants maintained their performance in the maintenance phase. Overall, all students improved after receiving the intervention.
In the same year as the previous study, Cihak & Bowlin (2009) conducted a study on the same type of VM (BVM). The researchers evaluated the ability to learn and maintain basic geometry skills via the influence of BVM utilizing hand-held computers for high school students with LD. Contrary to the previous study, this study just focused on one mathematical skill. The study consisted of three participants between 15 to 18 years of age. All three had LD in mathematics. A multiple probe design was used to examine geometry skills along with a maintenance phase to define the effectiveness of using BVM to assist the participants to gain and maintain the geometry skills.

Three phases were performed in this study: baseline, intervention, and follow-up. During the baseline phase, every student was given a 10-problem quiz at the beginning of each session. A specific geometry skill was selected for each session in which the participants were expected to achieve a stable baseline. In the intervention phase, the student was given a hand-held computer showing the video clips in which the teacher demonstrated each of the specific geometry skills. Participants were asked to view the video clips at home and work on a 10-problem assignment without any assistance while at home. The assignments were turned in the next day and graded immediately. During the maintenance phase, the study examined whether the BVM intervention influenced the student’s performance after six weeks in which the participants did not have access to both the hand-held computer and the instructional videos.

The study results indicated that the BVM is an effective intervention in teaching geometry skills to students with LD. All participants showed higher scores in geometry skills when using BVM compared to the baseline scores. For percent accuracy, the participants' scores from both intervention and maintenance phases ranged between 60% and 100%, while their percent independence ranged from 86.7% and 100%.
More recently, Satsangi et al. (2019a) performed a study to investigate the effectiveness of BVM in teaching word problems to students with LD who are taking geometry. The participants comprised three students between 14 and 17 years of age. The location of the study was a public high school. The researchers used a multiple probe design across all participants.

The independent variable in the study, BVM, was used to issue explicit instructions to the students on solving geometrical problems. Several dependent variables were used, including the percentage of correctly solved word problems during each intervention session, the percentage of steps on geometrical word problems performed independently in each session, the overall duration taken to solve the geometry word problems in each session, and the social validity of the feedback received from all participants.

The study included the following phases: baseline, intervention, and maintenance. For the baseline phase, the researchers assessed all students to determine their capacity to find correct solutions to word problems in geometry. While the participants were solving each assessment sheet, they only received positive verbal support. The researcher collected the data based on accuracy and duration. During the intervention phase, the researcher gave one assessment sheet to each participant alongside the five-word problems. All problems tested similar skills. They then watched a whole instructional video instructing them on how to solve the same problems as on the assessment sheet. After viewing the videos, the researcher asked the students to find solutions to five questions provided on the assessment sheets provided earlier. They could re-watch the videos as they worked out the problems. The researcher provided physical models using verbal directions whenever the students could not solve the problems correctly. The maintenance phase commenced three weeks into the intervention phase. The maintenance phase
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used the same procedures as those used in the intervention phase. The data was collected based on accuracy, independence, and duration.

The study results indicated that all participants showed higher scores in solving word problems when using BVM compared to the baseline scores. For percent accuracy, the participants' scores from both intervention and maintenance phases ranged between 60% and 100%, while their percent independence ranged from 86.7% and 100%.

In the same year as the previous study, Satsangi et al. (2019b) conducted a study focusing on students facing challenges in geometric word problems. This study compared the face-to-face explicit instruction to the use of BVM for teaching participants to solve geometry word problems. The participants in the study included three students between 14 and 16 years of age. The study was conducted in a public high school. All participants had LD in mathematics. A single-subject alternating treatments design was implemented in this study.

The study included two independent variables, BVM and explicit instruction. The students were shown an instructional video via an iPad that showed how to solve geometry word problems. After that, participants received explicit instruction on how to handle geometric word problems. There were four dependent variables: (a) the percentage of correctly solved geometry word problems each session; (b) the percentage of steps within every geometry word problem completed each session independently; (c) the total amount of time each session takes to finish geometry word problems; and (d) the answers to the questions about social validity that students were asked to answer.

The study implemented three phases: baseline, intervention, and best treatment. For the baseline phase, the researchers conducted five sessions for each student. They defined the students' performance before starting the intervention. They assessed the students to know how
well the students were able to solve geometry word problems without feedback or instruction from the researcher. For every session, the data was measured regarding problem-solving accuracy and session duration.

For the intervention phase, every student randomly alternated between the five sessions of each of the two treatment conditions. They received explicit instruction from a researcher or via BVM. When the students finished each session, they completed an assessment sheet with five unfamiliar word problems. After that, the data was collected based on accuracy, independence, and duration. Participants took part in three sessions solving word problems using the most effective treatment condition chosen during the intervention phase. Each of the sessions included five problems to be solved using the same strategy used during the baseline and intervention phases. After that, data was once again collected based on accuracy, independence, and duration.

The results indicated that both BVM and the face-to-face explicit instruction were highly effective compared to the baseline phase. All students averaged above 98% independence during both BVM and face-to-face explicit instruction. Two of the three participants achieved slightly higher accuracy scores during the explicit instruction than BVM.

More recently, Satsangi et al. (2020a) performed a study to compare the effectiveness of BVM and teacher-led modeling in teaching algebraic skills of linear graphing equations. The participants in the study included three secondary school students between 15 and 16 years of age. They all had an LD. The study took place in a public school.

A single-subject alternating treatments design was implemented in the study to compare BVM to teacher-led modeling for instructing children with LD. There were two independent variables, BVM and teacher-led modeling. The researchers described BVM interventions as the instruction a student receives through video lessons on their tablets. Teacher-led modeling
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Intervention was described as the face-to-face instructions provided by the teacher in the classroom environment. Both interventions were provided to teach how to graph linear equations. The dependent variables were as follows: (a) the percent accuracy defined by the percent of correctly graphed linear equations out of five problems for each session; (b) the percent of steps per problem finished independently; and (c) the total time needed to finish the problems each session.

There were four phases in this study: (a) baseline, (b) intervention, (c) best treatment, and (d) generalization. The baseline phase included five sessions. Each participant was given one assessment comprising five linear equations and asked to graph each without assistance. The researcher collected data on the duration and accuracy. During the intervention phase, every participant randomly alternated among five sessions in both instructions via BVM and teacher-led modeling. In both conditions, participants received the instruction on the wanted skill. After that, they were asked to complete an assessment containing five linear equations that they would graph. The data was collected based on independence, accuracy, and duration of sessions. During the best treatment phase, every participant participated in four sessions. They received the most effective treatment (BVM or teacher-led modeling) from the intervention phase based on their percent accuracy averages. The last phase was a generalization. One assessment containing five linear equations was given to each participant, and they were asked to graph each equation.

All participants improved when they received both interventions. One participant earned higher percent accuracy averages using BVM to learn linear graph equations, while the other two participants scored higher with the teacher-led modeling. All participants improved during the best treatment phases across each dependent variable, and they generalized the skill of solving linear graphing equations without instructions during the generalization phase.
In the same year as the previous study, Satsangi et al. (2020b) conducted a study using BVM intervention to teach algebra to students with LD. The study included students from a public high school. The researchers used a multiple probe design across all participants. A BVM of how to graph linear equations paired with a system of prompting was the independent variable. A total of five dependent variables were used in the study: (a) the percentage of well-graphed linear equations obtained in every session, (b) the percentage of all steps completed in each problem independently during each session, (c) the mean of the percentage of all prompts to complete on per problem handled in each session, (d) the total number of times the participant watched the video to complete a session, and (e) the total duration to finish each of the sessions.

During the baseline phase, the students were given assessments to measure their efficiency in graphing linear equations without any instruction from the researcher. During the intervention phase, the researchers gave the students a tablet with a BVM lesson on its screen and an evaluation sheet containing the five linear equations in each session. The researchers asked the students to watch the BVM one time in its entirety, showing them how to graph linear equations. Then children repeated the same steps displayed in the video with the five problems on their assessment sheet. After four weeks of the intervention, an extended intervention phase was performed. The researchers used the same steps they did in the intervention phase to measure if students retained the ability to utilize a BVM lesson to help them solve problems.

The results showed that the use of BVM for teaching algebra was an effective intervention. The students’ performance improved after the BVM intervention as compared to the baseline performance. For the extended intervention, all students' performance showed improvement from intervention to extended intervention on all measures. All participants showed a functional relationship between BVM and accuracy performance graphing equations.
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**Video Prompting**

Two studies implemented VP to teach functional math skills to high school and post-high school students. The participants in the studies included 14 students between 16 and 21 years of age. Six students were diagnosed with LD, four were diagnosed with ID, three were diagnosed with ASD, and one was diagnosed with OHI. All studies showed that all students' math performance increased after using VP intervention (Edwards et al., 2020; Kellems et al., 2016).

Kellems et al. (2016) conducted a study to assess the effectiveness of teaching multi-step math skills to students with disabilities using VP intervention. The participants included nine students with disabilities aged 18 to 21. One student was diagnosed with LD, four were diagnosed with ID, three were diagnosed with ASD, and one was diagnosed with OHI. They are from the post-high school transition program. A multiple probe design was implemented to assess the effect of using the VP in teaching multi-step math calculation skills: (a) calculating a 15% tip on a restaurant bill, (b) comparing the price per unit on grocery store items, and (c) adjusting a recipe for a different number of servings. The dependent variable was the percentage of the steps the participants completed properly.

There were four phases: (a) baseline, (b) intervention, (c) booster sessions, and (d) maintenance phases. During the baseline phase, the participants were required to solve the tasks without watching a video. Each student required materials to complete the task, including a pencil, paper, calculator, and question. They were required to sit down at the table in a room separately. While completing the questions, the participants didn't have access to an iPad with the video. Before the intervention phase, the researchers conducted pre-training on how to use the iPad. Then, the intervention phase started with similar conditions used in baseline, including all the materials that have been used except the iPad. The participants accessed videos
independently and watched the instructional videos in sections before finishing per task. After the participants completed tasks, the researchers collected data on the percentage of steps accomplished properly.

For the booster phase, one session was performed for all participants after three weeks of the intervention phase. This session was performed to define if VP intervention had affected the student’s performance over time. During this phase, all students were able to watch the videos. The session in this phase was identical to intervention sessions. After that, the researcher implemented the maintenance phase. The procedures during the maintenance phase were identical to the baseline phase (no instructions or watching a video).

All students' math performance improved during all phases when using the VP. The average percentage of steps completed accurately across all students was 13.8 during the baseline phase. After using the VP intervention, the average percentage across all students was 84 during the intervention phase, 89.7 during the booster phase, and 87.6 during the maintenance phase.

More recently, Edwards et al. (2020) conducted a study to examine whether VP intervention affected math skills (steps to solving percent-cost word problems) among students with LD. The participants included five high school students aged between 16 to 17. A multiple probes design was implemented. The independent variable was VP, and the dependent variable was the percentage of steps the student completed correctly.

The baseline, intervention, and post-test were conducted in this study. During the baseline phase, the participants were given the percent-cost word problems randomly selected in a quiet room and were told to solve the problem. For instance, a shirt costs $19.99. It's 30 percent off right now. What is the price of the shirt on sale? There was no instruction or watching video during the baseline. During the intervention phase, each student was asked to watch a video. The
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video was a pause after each step in the skill. When it paused, the student was asked to complete the step they watched. After they completed the step, the researcher asked the student to press in the middle of the iPad's screen to go to the second step. The student continued doing this until they learned the skill. During the post-test phase, it was done a month after the intervention phase. The researchers used the same procedures they did in the baseline phase to measure if students retained skills. The researcher collected data on the number of percent cost word problems completed correctly.

The results stated that the VP is an effective intervention in teaching math skills to students with LD. The mean percentage of word problems solved correctly for all students was 0% during the baseline phase. After using VP, the mean percentage of word problems solved correctly for all students was 100%. Also, all students maintained their skills during the post-test phase.

Chapter Summary and Literature Gap

This chapter has provided a critical literature review on using VM types in teaching mathematic skills to students with LD. The findings from this literature review suggested that the POV-VM, BVM, and VP are effective interventions in improving mathematic skills for students with LD in the middle, high, and post-high schools. This literature review supported the findings of a systematic review that was conducted by Boon et al. (2020) when mentioning that the VM intervention is an effective strategy to teach math skills to students with LD.

However, all of these studies have been applied to improve a certain math skill. For example, four studies focused only on fraction skills (Billingsley et al., 2009; Hughes, 2019; Morris et al., 2021), and three studies focused on geometry skills (Cihak & Bowlin, 2009; Satsangi et al., 2019a, 2019b). Although there are many important critical skills that students
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with LD face in the elementary schools, there is no study that has been applied using VM to teach any primary skills for elementary school students with LD. One of these essential skills that the students with LD in an elementary school face is addition skills (Nelson & Powell, 2017).

To fill the gap in the current literature, there is a need to implement VM interventions to develop the essential mathematic skills the students with LD face in elementary schools. There is no study that implemented POV-VM to teach the addition skills to elementary students with LD. Therefore, the current study aims to evaluate the effectiveness of an intervention that uses POV-VM to improve addition skills in elementary school students with LD in Saudi Arabia.
Chapter Three

Methodology

Overview

This study aimed to evaluate the effectiveness of the intervention Point-of-View Video Modeling (POV-VM) to improve math skills in children with Learning Disability (LD) in Saudi Arabia (KSA). This study is the first in the Middle East to evaluate the effectiveness of POV-VM on improving math skills in students with LD. This chapter describes the research method that was used in this study. It provides a description of the characteristics of the participants, setting details, and research design, including independent and dependent variables. Second, it provides a detailed review of the materials that were used, the procedures to implement the study, interscorer agreement, social validity, and treatment integrity. Finally, it addresses the data analysis methods.

Research Questions

The following research questions were addressed in this study:

1. Does POV-VM intervention develop increased proficiency in solving addition problems with regrouping for values under 100 in students with LD in KSA?

2. Do students retain math skill improvements (addition with regrouping for values under 100) after the POV-VM intervention was removed?

Participants

Eligibility Criteria

The following inclusion criteria were applied to recruit the students: (a) diagnosed of LD, (b) no prior documented experience with POV-VM, (c) received special education services in
math skills, (d) struggled with math problem-solving, especially addition with regrouping as referred by their current special education teacher, (e) could not solve more than three addition problems (2-digit plus 2-digit) in two minutes, (f) was able to read, (g) was able to follow directions given, (h) possessed the required fine motor skills to be able to use an iPad, and (i) had the pre-requisite skills to learn through VM (motor imitation - imitation of actions with objects - picture-to-object matching - computer picture-to-object matching - attending to videos).

**Recruitment**

After the study’s approval by the Institute Review Board (IRB) of Duquesne University, the researcher began recruiting potential participants. The researcher made a request for a scientific trip to the Saudi Arabian Cultural Mission (SACM). The SACM was responsible for sending the invitation letter to the Ministry of Education in KSA. Next, it sent the invitation to the appropriate school in Bishah city for this study to be conducted. After receiving approval from the school to implement the study, the researcher met with the school administrator to recruit teachers who engaged in the study to identify the appropriate participants from their classrooms. Then, the researcher met the teachers to explain the research procedures and give them permission forms to send to parents to allow their children to participate in the study. When the researcher received the permission forms, he screened the participants using the inclusion criteria.

After screening nine students, five of them did not meet the inclusion criteria. Four of the five students could solve more than three addition problems in two minutes, and the fifth one was not able to follow the directions given. The sixth student was eligible for this study, but he withdrew in the baseline phase (fifth session) by asking the LD teacher if he could stop participating in this study. In the end, three students were included in this research (Ahmed -
Faisal - Hamd). In order to preserve the participants' anonymity in this research, pseudonyms were used in lieu of their actual names. The participants were males because all educational levels in KSA are separated between males and females (Alquraini, 2013). Therefore, the researcher could just enter the male schools.

Table 1. Participant Information

<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
<th>Diagnosis</th>
<th>Grade level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmed</td>
<td>Male</td>
<td>10</td>
<td>LD (Math)</td>
<td>4th</td>
</tr>
<tr>
<td>Hamd</td>
<td>Male</td>
<td>10</td>
<td>LD (Math)</td>
<td>4th</td>
</tr>
<tr>
<td>Faisal</td>
<td>Male</td>
<td>10</td>
<td>LD (Math &amp; Writing)</td>
<td>4th</td>
</tr>
</tbody>
</table>

The participants for this study consisted of three children with LD, whose names were: (a) Ahmed, male, aged 10; (b) Hamd, male, aged 10; and (c) Faisal, male, aged 10. At the time of the study, the students lived in Bishah City, KSA. All students were in 4th grade. They all attended the same public elementary school. Their LD teacher was the same. So, he referred to them as having difficulty with math skills. They attended all their core academic education in the regular classroom with their peers, but their LD teacher taught them math skills in the resource room. They all were collaborative and friendly during all phases.

Setting

The researcher implemented this study at Alfatlah school (public elementary school) in Bishah City, KSA. He administered all phases (baseline, intervention, and maintenance) in a resource room to the three participants. The room was free of distractions and noises (quiet
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room. He met with each participant individually during school hours. Participants joined sessions during their math class times.

Research Design

The researcher used a single-subject, multiple-baseline design to implement this study. Single-subject design is conducted to investigate the effects of intervention across multiple behaviors, settings, or participants (Cooper et al., 2019). The researcher used a multiple baseline design across the three participants in this study to evaluate the effectiveness of an intervention that uses POV-VM to improve math skills in students with LD. This research method is an experimental design where different participants receive the same intervention in the same setting, but the intervention is introduced to each participant gradually across time (Cooper et al., 2019).

A multiple baseline across participants design requires all participants to begin the first phase (baseline) at the same time. This allowed the researcher to determine what the typical behavior level of the subject(s) was before implementing the intervention (Riley-Tillman & Burns 2009). This design incorporated at least three attempts to show the intervention impact (Kratochwill et al., 2012). After a stable baseline was observed during the baseline phase for the first participant, the researcher implemented the independent variable (POV-VM) to the first student. When the first participant achieved a steady state of responding with the introduction of the POV-VM, the researcher implemented the POV-VM intervention to the second participant. At the same time, the other students remained in the baseline phase. When the first student had reached some previously determined criterion for improvement performance and the second student’s baseline performance was steady, the POV-VM was implemented to the third student (Richards et al., 2014).
**Appropriateness of the Chosen Study Design**

The researcher chose a single-subject design because it is usually employed for studies involving a small number of participants with disabilities to examine the effectiveness of the intervention (Maggin et al., 2018). In addition, the researcher chose the multiple baseline design method because it is a powerful approach that permits the examination of behaviors across the baseline phase and the treatment phase to be replicated within the same research (Richards et al., 2014). The multiple baseline design also allowed the researcher to define and verify the effectiveness of the intervention with two or more participants who had the same behavioral needs (Richards, 2019). The multiple baseline design for this study is appropriate because it has been used extensively in implementing a specific VM approach (Bonnet, 2012).

**Independent Variable**

The independent variable was the POV-VM intervention used to improve addition skill (two-digit plus two-digit addition by regrouping problems). The regrouping means a person makes groups of ten when conducting operations such as addition. It occurs when a person works with double digits, which takes place any time a person has an answer larger than the number nine (Martin, 2017). The video was recorded from the visual perspective of the model, so it depicted what the model would see. The model’s hands were visibly performing the instructional steps needed to solve the addition problem with regrouping explicitly. The POV-VM was delivered through an instructional clip using an iPad. The researcher was the person who explained the addition with regrouping instructions explicitly in the video clip. The regrouping steps that the researcher explained in the video were based on the 2nd-grade math textbook in KSA (see Appendix A; Ministry of Education of Saudi Arabia, 2021).
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The intervention was implemented once per day, three times per week. When a student missed one of the scheduled intervention days, they attended a makeup session before proceeding with the following sessions. The intervention phase lasted seven weeks (21 sessions) for each student. Every session lasted approximately 20 minutes.

**Dependent Variable**

The dependent variable was the target outcome for the study (Maggin et al., 2018). The primary dependent variable in this study was the number of addition with regrouping problems the student solved correctly in two minutes (Problems Per Minute [PPM]). The secondary dependent variable was the number of digits the student solved correctly in two minutes (Digits Correct per Minute [DCM]).

Data was be collected using instructor-created data recording sheets across all phases (see Appendix C). The data recording sheet involved two columns: one for PPM and the other for DCM. After each student completed their 2-minute timed assessment, the researcher counted the PPM and calculated the DCM. For the PPM, the researcher reviewed each problem in the assessment and counted all correct problems. Then, the researcher wrote the total number of the correct problems in the PPM column at the end of each session.

For the DCM, the researcher reviewed each digit, counted all correct digits, then wrote the total number of the correct digits in the DCM column at the end of each session. It was scored as correct for each digit that appears in the right place value below the line (ones value or tens value). For example, if the answer to the addition problem was 29, and a child just wrote the number 9 (ones value), the researcher calculated it as 1 correct digit. If the child wrote both numbers 29 (ones value and tens value), the researcher scored them as 2 correct digits. If the student’s answer was 21, the student received one DCM for the 2 in the correct tens place value.
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(Wright, 2013). These dependent variables were measured in each session across the baseline, intervention, and maintenance phases.

Materials

Assessments

The researcher created four assessment worksheets to assess participant performance in solving the addition problems across the baseline, intervention, and maintenance phases of this study. All worksheets were identically designed and formatted during each phase (see Appendix D). The four worksheets had the same set of problems to control the difficulty level (12 addition with regrouping problems). The order of 12 addition problems were randomized across the worksheets to control order effects. Each problem involved two-digit plus two-digit addition problems. Across all phases, the researcher randomly chose the assessment the participant completed while ensuring that the participant did not receive the same worksheet two times consecutive.

iPad

The researcher provided the student with an iPad to watch the videos used during the intervention phase. Prior to the intervention sessions, the researcher placed the iPad on the table. The student was given a paper outlining the steps to access the clip (Appendix B). The five steps were: (a) the student puts on headphones; (b) the student turns on the iPad; (c) the student accesses the clip in the iMovie app; (d) the student watches the clip; and (e) the student turns off the iPad. If the student cannot follow the steps on the paper to access the video in the iMovie app, they were prompted verbally until they found the video. After watching the video, the student returned the iPad to the table.
**Point of View Video Modeling Clips**

Before implementing the intervention sessions, the researcher created three video clips focusing on two-digit plus two-digit addition with regrouping problems using the POV-VM method. Each video clip had a different addition problem (equal in difficulty) to be solved using the regrouping method. In the clip, the researcher followed the regrouping steps (see Appendix A) when solving the addition problem. The researcher used his iPad and stand to record these clips at eye level to simulate the point-of-view in which the hands and worksheet were shown. Each clip lasted approximately two minutes and illustrated how to solve the addition problems using the regrouping strategy. The iMovie software was used in editing the created videos as needed. These video clips were randomly distributed to students during the intervention phase.

**Procedures**

**Baseline Phase**

To determine the stability of the dependent measure, at least three baseline data points were required (Kadzin, 2010). During each session, the researcher put all materials needed on the participant's table (assessment worksheet, pencils, and eraser). The researcher randomly chose the assessment out of the four assessments in each session. The assessment involved 12 addition problems (2-digit plus 2-digit) (see Appendix D). Each student took a seat in front of the researcher (one-on-one). The following instructions were provided prior to beginning the assessment: “You will receive a worksheet including some addition problems. Please, start solving the addition problems until I say, Time's up.” The researcher used his phone to time the assessment for two minutes. The researcher said "Time's up" once the two minutes were up. After that, the researcher took the worksheet. When the researcher affirmed the stability of the
baseline data’s level and trend, the first student begun the intervention phase while all other students were continuing in the baseline phase (Cooper et al., 2019).

**Intervention Phase**

The independent variable, POV-VM instruction, was delivered via a video clip shown on an iPad. The clips showed similar instructional procedures based on addition problems in the 2nd-grade math textbook (2-digit plus 2-digit) in KSA (Ministry of Education of Saudi Arabia, 2021). The three video clips showed how to solve two-digit plus two-digit addition by regrouping problems while explaining the instructional procedure steps (see Appendix A). Each clip had a different addition problem to be solved using regrouping, and all problems had the same level of difficulty (2-digit plus 2-digit). Each video lasted approximately two minutes. The researcher randomly chose one of the three clips on the iPad prior to each intervention session, so when the student accessed the iMovie app, the chosen video was ready to watch.

The following procedures occurred during each intervention session. The researcher had the session materials available on the student's table: (a) assessment worksheet, (b) iPad, (c), pencils; (d) eraser; (e) and paper outlining the steps to access the clip on the iPad (see Appendix B). The researcher chose one assessment at random from the four assessments, and the assessment involved 12 addition problems (2-digit plus 2-digit) (see Appendix D).

Each participant sat in front of the researcher (one-on-one). After that, the researcher said, “You are going to watch a short video that will assist you in solving the addition of numbers using a regrouping strategy. Please, follow the steps on the paper to know how to access the clip on the iPad.” If the participant could not follow the steps to access the clip, they were verbally prompted until they play the clip in the iMovie app. After watching the video (one time), the researcher asked the student to turn the iPad off and place it on the table. He said
"Please, start solving the addition problems until I say, Time's up.” The researcher timed this assessment for two minutes by using his phone. When the two minutes were finished, the researcher said, "Time’s up" and took the worksheet.

This assessment was performed to evaluate the extent to which the student had learned the skill through the video clip. Once the intervention session was completed, each student received verbal encouragement for completing the session. The researcher praised the student verbally, such as “good work” and “well done.”

**Maintenance Phase**

The researcher conducted this phase to assess whether the effects of the intervention were maintained following the removal of the intervention. The researcher conducted three sessions during this phase. The researcher repeated the baseline phase procedures. Assessments were identical to those used during the baseline and no intervention was occurred during this phase.

**Interscorer Agreement**

The interscorer agreement (ISA) is the extent to which scores obtained from two or more scorers are consistent. The researcher collected the data via the completion of the assessment worksheets across each session in the study. To prove that the researcher correctly assessed the number of PPM and the number of DCM, an independent scorer (LD teacher) also scored both PPM and the DCM. To do that, the researcher trained the LD teacher on the scoring process. The researcher gave him one of worksheets that was given to the participants. After that, the researcher showed the teacher how to count the PPM first. The researcher told the LD teacher how to review each problem in the worksheet and count all correct problems. Then, he showed the LD teacher how to write the total number of correct problems in the PPM column in the data recording sheet (see Appendix C). For the DCM, the researcher showed the LD teacher how to
review each digit, count all correct digits, then wrote the total number of the correct digits in the DCM column in the data recording sheet (see Appendix C). After showing the LD teacher how to score both PPM and the DCM, the researcher asked the LD teacher to do it independently until the LD teacher was able to count both PPM and the DCM two successive times successfully.

The LD teacher randomly chose 30% of the assessment worksheets across study phases and participants, and then calculated the PPM and DCM. The researcher used a trial-by-trial ISA because the researcher had an event-based recording procedure. To estimate the data, percentages of the agreement was calculated. The researcher calculated the percentage by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying it by 100. The acceptance level of ISA is 80% and higher (Cooper et al., 2019).

Social Validity

Social validity is usually used in studies to refer to the acceptability of and satisfaction with intervention procedures and evaluated by soliciting opinions from the participants who receive them (Luiselli & Reed, 2011). To establish the social validity of this study, the researcher provided the Participant Social Validity Questionnaire (see Appendix E) to all participants after the final phase of this study (maintenance phase). The researcher used this questionnaire because it is the most frequently used method for assessing social validity (Cooper et al., 2019). In addition, the social validity questionnaire is appropriate in this study because it measured if the POV-VM intervention is acceptable and efficient for the students. The questionnaire included a five-point Likert scale. The five-point Likert scale included: (a) Strongly Disagree; (b) Disagree; (c) Neutral; (d) Agree, and (e) Strongly Agree. Each rating on the scale had its own emoji, such
as a smiling mouth for the strongly agree, to make the scale more developmentally appropriate for children.

**Treatment Integrity**

Treatment integrity refers to the degree to which an independent variable is delivered as planned (Perepletchikova et al., 2007). The treatment integrity helped the researcher to make sure the intervention phase was being performed as explained and determine if any steps were missed. The researcher assessed the fidelity of the treatment based on the Treatment Integrity Checklist (see Appendix F). The checklist was comprised of the following steps: (a) organize the environment (resource room) in which viewing of the clip happens, (b) put all materials needed on the student's table (worksheet, iPad, pencils, eraser, and paper outlining the steps to access the video clip), (c) ask the student to come for the intervention phase during his math class, (d) ask the student to participate in watching the video, and (e) praise the student verbally (good work or well done). In the checklist, “Yes” indicated a step was implemented, and “No” indicated a step was not implemented.

**Data Analysis**

Visual analysis is most often used to analyze single-subject design studies to determine whether a causal relationship exists between the dependent and independent variables (Horner et al. 2005). The researcher presented the outcomes of this study visually by creating a time-series graph (line graph). The single-subject design used these graphs to show the data and to display the effects of a certain intervention on someone (Fraenkel & Wallen, 2006). The graph consisted of evaluating the following characteristics: (a) level, (b) trend, (c) variability, (d) immediacy of effect, (e) overlap, and (f) consistency of data patterns (Ledford et al., 2018). These
characteristics gave the researcher the necessary data to assess the effectiveness of POV-VM on accuracy and DCM of addition with regrouping worksheets.

Level characteristic refers to the average (mean) of the total data points in every phase. The researcher used the average to compare the data among the baseline and intervention phases. The trend refers to the slope of the line of best-fit for every phase to determine the overall direction of data. The researcher determined the trend visually. The trend can be positive which means that the value of the data increases. It can also be negative, which means the value of the data decreases. Finally, it can be zero, which means that the value of the data is little or not changing over time. The next characteristic was variability, which refers to the variations in data values from one session to the next. It was assessed visually within a phase and across all phases.

The next characteristic was the immediacy of effect. It refers to the extent of data pattern change between two phases. It was measured by comparing the last three baseline data points to the first three intervention data points. The overlap refers to a degree to which data from one phase are on par with data from an adjacent phase. The researcher measured it by calculating the percentage of nonoverlapping data (PND) between the phases. This was calculated using the following equation: (1) count the number of data points that do not overlap, (2) count all the data points, and (3) divide the non-overlapping data points by all the data points and multiply it by 100. Lastly, the consistency of data patterns from the baseline, intervention, and maintenance phases was visually compared to determine data consistency across the same phases (Ledford et al., 2018). Figure 1 is a flow chart of the procedures of the current study.
Figure 1 Flow Chart of the Current Study Procedures
Chapter Four

Results

Overview

The purpose of this study was to evaluate the effectiveness of an intervention that uses Point-of-View Video Modeling (POV-VM) to improve addition focused math fact skills for three elementary students with a Learning Disability (LD) in Saudi Arabia (KSA). In the previous chapter, the researcher implemented three phases in this study (Baseline, Intervention, and Maintenance). During the baseline phase, the researcher gave all students assessment worksheets (addition problems) to evaluate their performance before applying the POV-VM intervention.

After that, the researcher implemented the intervention phase. In this phase, he asked the participants to watch a video that showed how to solve addition problems with regrouping (POV-VM) and then asked the students to solve assessment worksheets to evaluate their performance after the POV-VM intervention. After two weeks of the intervention phase, the maintenance phase was implemented. The researcher conducted this phase to assess whether the effects of the POV-VM were maintained following the removal of the intervention. The researcher repeated the baseline phase procedures during the maintenance phase.

In this chapter, the researcher summarizes the results of the baseline, intervention, and maintenance phases using visual analysis (level, trend, variability, the immediacy of effect, overlap, and consistency of data patterns). In addition, the researcher discusses the interscorer agreement to prove that the researcher correctly assessed the dependent variables (PPM and DCM). Finally, the researcher discusses the treatment integrity collected and the social validity of the study.
Dependent Variables

Problems Per Minute

The first dependent variable in this study was Problems Per Minute (PPM). The researcher counted the number of addition with regrouping problems the students solved correctly in two minutes out of a total of 12 problems. The researcher then divided the total by two (e.g., 12/2=6) for each worksheet assessment for the students across all phases because the researcher wanted to get per-minute results. Therefore, the highest score that could be reached in the study was 6 for the PPM. The results indicated that all students improved their addition skills after completing the intervention phase with an average of 5 PPM for all students compared to the baseline phase with an average of 0.4 PPM. After two weeks of implementing the intervention phase, all students retained the skill improvements during the maintenance phase with an average of 5.5 PPM. The consistency of data patterns among all students was similar across all baseline phases, intervention phases, and maintenance phases. All data across these three phases are exhibited in the graph in Figure 2. Data from the baseline and intervention phases are also displayed in Table 2.
Figure 2 Participants’ Problems Per Minute During Phases.
Ahmed’s Performance.

Baseline phase. The first student in this study was Ahmed. His baseline phase lasted for three sessions. When Ahmed solved addition problems with regrouping during the baseline phase, his answers were low and steady, with no trend. Ahmed’s average performance level in this phase was 0.6 PPM, ranging from 0.5 - 1 PPM.

Intervention phase. Immediately after the intervention was introduced, Ahmed demonstrated an increase in performance level when solving the addition problems with regrouping. His average performance level in this phase was 5.4 PPM with a positive trend and low variability, ranging from 3.5 - 6 PPM. This led to a positive change of 4.8 between the baseline and intervention phases. The immediacy of effect for Ahmed was 4 PPM, meaning his performance immediately improved by 4 PPM when the intervention was introduced. The percentage of nonoverlapping of data (PND) across the baseline and intervention phases was 100%. These results indicate that his performance level demonstrated improvement in solving the addition problem with regrouping.

Maintenance phase. Two weeks after the intervention phase, the researcher conducted three sessions within one week of maintenance phase with Ahmed. His performance level in the maintenance phase (i.e., an average of 5.8 PPM) was slightly higher than in the intervention phase with low variability (i.e., an average of 5.4 PPM), ranging from 5.5 - 6 PPM. PND across the baseline and the maintenance phases was 100%. These results indicate that Ahmed was able to retain the addition skill gained after the POV-VM intervention was removed.

Hamd’s Performance.

Baseline phase. The second participant in this study was Hamd. His baseline phase lasted for seven sessions. When he solved the addition problems with regrouping during this phase, his
answers were low and steady, with no trend. His average performance level in this phase was 0.2 PPM, ranging from 0 - 0.5 PPM.

**Intervention phase.** When the intervention was introduced, Hamd had a quick increase in performance level when solving the addition problems with regrouping. His average performance level in this phase was 4.5 PPM with a positive trend and low variability, ranging from 3 - 5.5 PPM. This led to a positive change of 4.3 PPM between the baseline and intervention phases. The immediacy of effect for Hamd was 3.3 PPM, meaning his performance immediately improved by 3.3 PPM when the intervention was introduced. The PND across the baseline and intervention phases was 100%. These results indicate that his performance level demonstrated improvement in solving the addition problem with regrouping.

**Maintenance phase.** Two weeks after the intervention phase, the researcher conducted three sessions within one week of maintenance phase with Hamd. His average performance level in this phase was 5.1 PPM, which was higher than in the intervention phase and low variability (i.e., an average of 4.5 PPM), ranging from 5 - 5.5 PPM. PND across the baseline and the maintenance phases was 100%. These results indicate that Hamd was able to retain the addition skill gained after the POV-VM intervention was removed.

**Faisal’s Performance.**

**Baseline phase.** The last student in this study was Faisal. This phase persisted for 11 sessions. When solving the addition problems with regrouping during this phase, his answers were low and steady, with no trend. The average of his performance level in this phase was 0.5 PPM, ranging from 0 - 1 PPM.

**Intervention phase.** After being introduced to the intervention, Faisal demonstrated an immediate increase in his performance level. His average performance level in this phase was 5.1
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PPM with a positive trend and low variability, ranging from 4 - 6 PPM. This led to a positive change of 4.6 PPM between the baseline and intervention phases. The immediacy of effect for Faisal was 3.6 PPM, meaning his performance immediately improved by 3.6 PPM when the intervention was introduced. The PND across the baseline and intervention phases was 100%. These results indicate that his performance level demonstrated improvement in solving the addition problem with regrouping.

**Maintenance phase.** Two weeks after the intervention phase, three sessions were conducted in one week for the maintenance phase with Faisal. The average of his performance level in this phase was 5.6 PPM, which was slightly higher than that in the intervention phase and low variability (i.e., an average of 5.1 PPM), ranging from 5.5 - 6 PPM. PND across the baseline and the maintenance phases was 100%. These results indicate that Faisal was able to retain the addition skill gained after the POV-VM intervention was removed.

<table>
<thead>
<tr>
<th>Table 2 Participants’ Problems Correct Per Minute Across Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Ahmed</td>
</tr>
<tr>
<td>Hamd</td>
</tr>
<tr>
<td>Faisal</td>
</tr>
</tbody>
</table>

**Digits Correct per Minute**

The secondary dependent variable in this study was Digits Correct per Minute (DCM). The researcher counted the number of digits the student solved correctly in two minutes, and then divided the total by two (i.e., 24/2=12) for each worksheet assessment for the students
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across all phases because the researcher wanted to get per-minute results. Therefore, the highest score that could be reached in the study was 12 for the DCM. The results showed that all students improved in addition skills after performing the intervention phase with average 10.5 DCM compared to the baseline phase with average 1.4 DCM, and they all retained the skill improvements during the maintenance phase with the average 11.2 DCM. The consistency of data patterns among all students was similar across all baseline phases, intervention phases, and maintenance phases. All data across these three phases are exhibited in the graph in Figure 3. Data from the baseline and intervention phases are also shown in Table 3.
Ahmed’s Performance.

*Baseline phase.* Ahmed's baseline phase consisted of three sessions. In the baseline phase, Ahmed's answers were low and steady, with no trend. In this phase, Ahmed's average performance level was 1.5 DCM, ranging from 1 to 2 DCM.
**Intervention phase.** Ahmed's DCM performance level increased after the intervention was implemented. His average performance level during this phase was 11.3 DCM with a positive trend and low variability, ranging from 9 - 12 DCM. This led to a positive change of 9.8 DCM between the baseline and intervention phases. The immediacy of effect for Ahmed was 9 DCM, meaning his performance immediately improved by 9 CDM when the intervention was introduced. The PND across the baseline and intervention phases was 100%. These results indicate that his performance level demonstrated improvement in solving the addition problem with regrouping.

**Maintenance phase.** The researcher performed three sessions within one week of maintenance phase with Ahmed two weeks after the intervention phase. His performance level during the maintenance phase (i.e., an average of 11.6 DCM) was slightly better than during the intervention phase and low variability (i.e., an average of 11.3 DCM), which ranged from 11 to 12 DCM. PND across the baseline and the maintenance phases was 100%. These results indicate that Ahmed was able to retain the addition skill gained after the POV-VM intervention was removed.

**Hamd's Performance.**

**Baseline phase.** Hamd's baseline phase consisted of seven sessions. When he solved the addition problems with regrouping during this phase, his answers were low and steady, with no trend. His average performance level in this phase was 0.9 DCM, ranging from 0 - 1.5 DCM.

**Intervention phase.** After being introduced to the intervention, Hamd demonstrated an immediate increase in his performance level. His performance during this phase averaged 9.4 DCM with a positive trend and low variability, ranging from 6.5 - 11.5 DCM. This led to a positive change of 8.5 DCM between the baseline and intervention phases. The immediacy of
effect for Hamd was 6.3 DCM, meaning his performance immediately improved by 6.3 CDM when the intervention was introduced. The PND across the baseline and intervention phases was 100%. These results indicate that his performance level demonstrated improvement in solving the addition problem with regrouping.

**Maintenance phase.** Two weeks after the intervention, the researcher performed three sessions of maintenance phase with Hamd over a one week. During this phase, his average performance level was 10.3 DCM, which was greater than that of the intervention phase and low variability (9.4 DCM), which ranged from 10 to 11 DCM. PND across the baseline and the maintenance phases was 100%. These results indicate that Hamd was able to retain the addition skill gained after the POV-VM intervention was removed.

**Faisal's Performance.**

**Baseline phase.** Faisal was the last student to participate in this portion of the study. There were 11 sessions during this phase. When he answered addition problems with regrouping, his answers were low and steady, with no trend. His performance level averaged 1.6 DCM, ranging from 0.5 to 2.5 DCM.

**Intervention phase.** When the intervention was introduced, Faisal's performance level immediately improved. His average performance level during this phase was 10.4 DCM with a positive trend and low variability, ranging from 8 - 12 DCM. This led to a positive change of 8.8 DCM between the baseline and intervention phases. The immediacy of effect for Hamd was 7.1 DCM, meaning his performance immediately improved by 7.1 CDM when the intervention was introduced. The PND across the baseline and intervention phases was 100%. These results indicate that his performance level demonstrated improvement in solving the addition problem with regrouping.
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*Maintenance phase.* Two weeks following the intervention phase, three sessions were performed in one week for the maintenance phase on Faisal. During this phase, his average performance level was 11.6 DCM, which was greater than the intervention phase's average performance level (5.1 DCM) and low variability, ranging from 11.5 to 12 DCM. PND across the baseline and the maintenance phases was 100%. These results indicate that Faisal was able to retain the addition skill gained after the POV-VM intervention was removed.

**Table 3** Participants’ Digits Correct per Minute Across Phases

<table>
<thead>
<tr>
<th>Participants</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Average</td>
<td>Range</td>
</tr>
<tr>
<td>Ahmed</td>
<td>1 - 2</td>
<td>1.5</td>
<td>9 - 12</td>
</tr>
<tr>
<td>Hamd</td>
<td>0 - 1.5</td>
<td>0.9</td>
<td>6.5 – 11.5</td>
</tr>
<tr>
<td>Faisal</td>
<td>0.5 – 2.5</td>
<td>1.6</td>
<td>8 - 12</td>
</tr>
</tbody>
</table>

**Interscorer Agreement (ISA)**

The reliability of the data collected was assessed by an independent scorer (LD teacher). The researcher used a trial-by-trial ISA because the researcher had an event-based recording procedure. The researcher trained the LD teacher how to count both the PPM and the DCM until the LD teacher was able to count both the PPM and DCM two successive times successfully. After that, the LD teacher randomly chose 30% of the assessment worksheets across study phases and participants and calculated the PPM and DCM. The researcher calculated the percentage by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying it by 100. The ISA across study phases was 100% for all three participants.

**Treatment Integrity**
The treatment integrity of the POV-VM intervention was assessed to make sure the intervention phases were being performed as explained and to determine if any steps were missed. It was evaluated using Treatment Integrity Checklist (see Appendix F). The checklist was comprised of the following steps: (a) organize the environment (resource room) in which viewing of the clip happens, (b) put all materials needed on the student's table (worksheet, iPad, pencils, eraser, and paper outlining the steps to access the video clip), (c) ask the student to come for the intervention phase during his math class, (d) ask the student to participate in watching the video, and (e) praise the student verbally (good work or well done). The treatment integrity for Ahmed, Hamd, and Faisal was 100%.

Social Validity

After the maintenance phase, the researcher provided the Participant Social Validity Questionnaire (see Appendix E). The social validity questionnaire was conducted in this study to measure if the POV-VM intervention was acceptable and efficient for the students. The questionnaire included a five-point Likert scale. The five-point Likert scale included: (1) Strongly Disagree; (2) Disagree; (3) Neutral; (4) Agree, and (5) Strongly Agree. First, the researcher asked the participants to put a circle on a number between 1 (strongly disagree) and 5 (strongly agree). Then, the participants read the statements in the questionnaire independently and they all circled the number 5 “strongly agree” for all of the statements in the questionnaire. These results indicated that the participants' opinions were highly acceptable and satisfied with the intervention.
Results Summary

This study has demonstrated the effectiveness of using POV-VM to improve the addition skills of elementary students with LD in KSA (see Figure 2, Figure 3, Table 2, and Table 3). Two weeks after the intervention phase, the results showed that all participants could still retain the addition skills during the maintenance phase. Also, the results indicated that the ISA was 100% between the researcher and a second scorer. For the social validity, all participants reported that the POV-VM was easy, enjoyable, and helpful (see Appendix E).
Chapter Five

Discussion

Overview

The purpose of this study was to evaluate the effectiveness of the POV-VM intervention to improve the addition skills of students with LD in KSA. This chapter presents a discussion of the study’s results presented in Chapter 4. It also describes how they compare to previous studies on the relationship between POV-VM intervention and math skills of students with LD. Finally, a review of the implications and limitations of the current study and recommendations are discussed.

Discussion of Research Findings

This study evaluated the effectiveness of the POV-VM intervention to improve addition skills of students with LD in KSA. The research questions in the current study were: (1) Does POV-VM intervention develop increased proficiency in solving addition problems with regrouping for values under 100 in students with LD in KSA?, and (2) Do students retain math skill improvements (addition with regrouping for values under 100) after the POV-VM intervention is removed?

Based on the visual analysis of the data included in Chapter 4, POV-VM provided a significant increase in PPM (between 0.4 PPM to 5 PPM on average between baseline and intervention) in all three students. Also, POV-VM provided a significant increase in DCM (between 1.4 DCM to 10.5 DCM on average between baseline and intervention) in all participants. In addition, all the students retained their high level of performance with an average of 5.5 for PPM and an average of 11.2 for DCM after two weeks of implementing the intervention phase. The consistency of data patterns among all students was similar across all
baseline phases, intervention phases, and maintenance phases. Therefore, the multiple baseline across participants demonstrated a functional relationship between the independent variable (POV-VM) and the dependent variables (PPM and DCM).

During the baseline, Ahmed, Hamd, and Faisal could not solve more than one PPM. Their performance average out of 6 PPM was 0.6, 0.2, and 0.5, which means their level on the PPM was low. For the DCM, they could not solve more than three DCM out of 12 DCM. Their performance average was 1.5, 0.9, and 1.6, which also means that their level on the DCM was low.

Immediately after the POV-VM was introduced during the intervention phase, all the students had a sharp increase in performance when solving the addition problems with regrouping. For example, Ahmed and Faisal were able to solve 6 PPM nine times during the intervention phase. Six was the highest score that could be reached in the study for the PPM, which means that their performance in solving the addition problem with regrouping was highly improved compared to the baseline phase. Also, Hamd had an increase in performance when solving the addition problems with regrouping. The highest score he was able to reach was 5.5 PPM, which was still a high score during the intervention phase (see Figure 2). The PND across the baseline and intervention phases for all participants was 100%.

The researcher implemented the maintenance phase two weeks after the intervention phase. During this phase, Ahmed, Hamd, and Faisal retained math skill improvements after the POV-VM intervention was removed. The average of their performance in this phase was 5.8, 5.1, and 5.6 PPM out of a possible 6 PPM, which was higher than that in the intervention phase (see Figure 2). These results indicate that the intervention was highly successful in improving all the students' performance in solving the addition problems with regrouping.
The results of this study indicate a positive improvement for the participants. The addition skill that the participants acquired after the POV-VM intervention will make their lives easier inside and outside the school because one of the key areas to success in life is learning basic math skills (e.g., addition skills). Also, the addition skills that participants gained will help them in school because it is a required skill in the school curriculum (Moursund, 2005).

**Comparing Current and Previous Studies Findings**

The participants in this study consisted of three students with LD in 4th grade. The LD teacher referred to them as having difficulty with math skills. The results support the findings of the literature review mentioned in the first two chapters of this dissertation. All participants benefited from the POV-VM, and they were able to retain math skill improvements after the POV-VM intervention was removed during the maintenance phase.

In the previous studies, the four types of VM (POV-VM, BVM, VP, and VSM) were proven to be successful in teaching desired tasks/behaviors for students with certain disabilities (e.g., LD), such as social communication skills, academic skills, vocational skills, play skills, and functional/daily living skills (Blum-Dimaya et al., 2010; Charlop et al., 2010; Cihak & Schrader, 2008; Hughes, 2019; Wynkoop et al., 2018). The most relevant findings related to the use of VM to teach math skills to students with LD were found in the systematic review by Boon et al. (2020) which indicated VM was beneficial in teaching math skills to students with LD.

The study conducted by Hughes (2019) evaluated the effectiveness of POV-VM in teaching fractions to three middle school students with LD. All participants' performances immediately improved after implementing the intervention, and they all retained and generalized the learned skill during the maintenance and generalization phase. In addition, the study conducted by Cihak & Bowlin (2009) evaluated the effectiveness of using BVM to assist the
participants in gaining and maintaining geometry skills for three high students with LD. All participants demonstrated mastery of the skill and maintained the skill after implementing the intervention phase. In addition, Edwards et al. (2020) conducted a study to examine whether VP intervention affected math skills (steps to solving percent-cost word problems) among high school students with LD. The results indicated that the VP intervention was effective in teaching math skills to students with LD because the mean percentage of word problems solved correctly for all students during the baseline phase was 0% while after the VP intervention, it was 100%. Also, all participants maintained their skills during the maintenance phase.

There were several differences between this study and previous studies. The previous studies were only applied in middle, high, and post-high schools, unlike the current study, which was implemented in an elementary school. Also, they were applied outside the KSA while the current study was implemented in the elementary school in KSA. The results of the current study proved that the POV-VM was effective in teaching addition skills to elementary students with LD, and they retained the learned skill during the maintenance phase. The current study helps to enrich the current literature in this field.

In conclusion, the present study and the previous studies implemented the VM methods to teach mathematic skills to students with LD. The findings of the present study were consistent with those of similar studies discussed in Chapter 2 of this dissertation which demonstrated the clear impacts of using POV-VM to improve math skills among students with LD (Billingsley et al., 2009; Cihak & Bowlin, 2009; Edwards et al., 2020; Hughes, 2019; Kellems et al., 2016; Morris et al., 2021; Satsangi et al., 2019a, 2019b, 2020a, 2020b; Yakubova et al., 2020). Furthermore, all students who participated in the current study and the previous studies improved their math skills after implementing the VM methods.
Implications for Practitioners

This study is the first in the Middle East to evaluate the effectiveness of POV-VM on improving the academic skills (math skills) in students with LD. This study provides a basis for practitioners and researchers to repeat and expand the study in the Middle East, specifically KSA. The positive results shown by the current study contribute significantly to the field of special education, especially for LD, in the KSA.

Unfortunately, despite the positive results of the current study to improve the addition skills for students with LD, practitioners in schools lack the skill to access this study, as well as other studies. As mentioned by the LD teacher, they were not trained to know how to access any study before they became teachers. Therefore, they use the usual teaching methods, not EBPs (e.g., POV-VM). The result was that the students could not solve three addition problems within two minutes before implementing POV-VM. After applying the evidence-based intervention (POV-VM), the participants solved 12 addition problems within two minutes.

When applying the POV-VM intervention, the LD teacher was enthusiastic about being able to use this intervention in the future to teach other mathematical skills to his students based on the following: (1) the positive results after applying the intervention to the participants, (2) the ease to implement POV-VM in the classrooms, and (3) the students' positive answers to the social validity questionnaire. The LD teacher also reported that the mathematics teacher noticed the participants told their peers that they had benefited from the intervention and were happy while talking about the intervention with their peers. All of this factors motivate practitioners to implement this intervention in their classes to improve the mathematical skills of their students.

The positive results observed by the LD teacher and mathematics teacher in the students’ performance showed them the importance of using POV-VM as an effective strategy in their
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classrooms. The advantages of the POV-VM intervention are it is not costly and requires less
time for training (Bagaiolo et al., 2017). As noted previously from the literature review in
Chapter 2, it has been successful with different grade levels and types of math problems.
Teachers can use POV-VM as the teaching method by videotaping the targeted task that the child
is required to learn. The child is given the video to watch and time to memorize and imitate the
targeted tasks.

It is also essential to involve parents in the application of POV-VM. This intervention can
be used in a wide array of settings. It is one of the interventions parents can implement to
develop math skills outside of school for their children (Merrill & Risch, 2014). Parents can
teach many math skills through POV-VM intervention because it is easily implemented and
inexpensive, such as using their phones to implement the intervention. A study by Besler and
Kurt (2016) indicated that the VM intervention that mothers provided was effective in helping
their children with LD. A student can watch the video that displays the target skill at a home,
park, or anywhere the student or parents want.

Implications for Research

A limited number of studies have implemented POV-VM as an intervention to improve
the mathematic skills of students with LD (Billingsley et al., 2009; Cihak & Bowlin, 2009;
Edwards et al., 2020; Hughes, 2019; Kellems et al., 2016; Morris et al., 2021; Satsangi et al.,
2019a, 2019b, 2020a, 2020b; Yakubova et al., 2020). Although these studies showed positive
results in developing mathematic skills, no study used the POV-VM to teach mathematic skills to
students with LD in the Middle East (KSA). Therefore, the current study was applied in KSA.

Positive results from the current study give future researchers solid motivation to expand
this intervention into developing academic skills for students with LD. For example, researchers
can apply the POV-VM not only for the addition skill but also for other math skills, such as subtraction and multiplication, in elementary schools. Also, they can apply POV-VM to different grade levels, such as middle and high schools, and choose more challenging skills, such as algebra. In addition, they can extend the scope and use the POV-VM to develop other academic skills, such as reading and writing, for students with LD. For example, a researcher can evaluate the effectiveness of using POV-VM to teach the steps for writing letters that use curved lines (e.g., S and U) for students with LD. Students with LD can watch a video showing a skilled person writing letters that use curved lines step by step. After watching the video, students can follow the steps they saw on the video to correctly write the letters.

**Implications for Policy**

The Ministry of Education (MOE) is the primary educational institution in KSA responsible for all educational decisions (e.g., education policies) that are made (World Education Services, 2020). Even though the MOE has provided funding to the Special Education Department to improve the standard of special education in all KSA cities, it lacks the inclusion of effective learning methods (e.g., POV-VM) to teach and develop math skills for students with LD in KSA. The LD teacher in the current study mentioned that he used to teach his students the addition skills by the fingers, although there was no development in the students' addition skills, as he believed that they would develop over time. However, when the POV-VM was used, the students improved from the first session in the intervention phase.

To effectively implement this effective practice, the MOE should include the EBP (e.g., POV-VM) as part of teachers' preparation programs in colleges of education in KSA universities. Teachers will be able to use them to teach students with LD in their classrooms. For current teachers, the MOE should provide professional training programs to teach them to understand
effective teaching methods (e.g., POV-VM) and how to apply them to their students. Also, the MOE should establish a framework for monitoring and evaluating teaching methods on an ongoing basis to ensure that the methods used in schools are EBP.

**Limitations**

The current study added new information to the field regarding the effectiveness of using POV-VM in improving addition focused math fact skills for students with LD in KSA. However, this study has some limitations. The first limitation was the small number of participants included in the study. Even though Cooper et al. (2019) stated that a single-subject design should include at least three students, it is recommended that this research be repeated with additional children to demonstrate continued experimental control (Horner et al., 2005).

A second limitation was that the researcher focused on boys aged 10 to 12. KSA is currently experiencing changes and reforms in many fields, including education. Among these changes is that male students in the primary grades (first - second - third) have been transferred to girls' schools, which the male researcher cannot reach because all educational levels in KSA are separated between males and females (Alquraini, 2013). This limitation will affect the generalizability of the research results to elementary school students. It can be overcome by having a female researcher apply the study in order to include female participants.

The third limitation was that the researcher did not note which students finished solving the 12 addition problems before the end of the specified period (two minutes) across the intervention and maintenance phases. These students may have been able to solve more than 12 addition problems within the 2-minute period. This could have resulted in a higher number of problem-solving skills demonstrated by the students. Therefore, in the future, researchers should select measures which have more problems than the students would be able to solve within that
VIDEO MODELING AND STUDENTS WITH LD IN MATHEMATICS

timeframe to ensure there is not an artificial ceiling of the number of problems the students can complete.

A fourth limitation was attrition. There was an absence of some students during the study. The researcher was supposed to be in school three days a week, but he attended every day to apply three sessions for each student. Therefore, in the future, researchers should stress the significance of attendance every day of the week as well as specify rewards if students attend every day.

The last limitation was that the researcher did not implement the generalization phase. The generalization phase is an important post-intervention step that shows whether the interventions had a meaningful impact on the research participants in different settings. It is an important step because it increases the likelihood that the student will be successful at completing the task independently in different settings. In addition, if the teachers see positive results in this phase, they will be more excited to apply the intervention to their students wherever they want.

**Recommendation for Practitioners**

The current study demonstrated positive results in examining the effectiveness of using POV-VM to improve addition focused math fact skills for three elementary students with LD in KSA. Based on the current study's results, some recommendations should be given to practitioners who are always close to students with LD (e.g., an LD teacher, a general education teacher, or a paraprofessional). The practitioners should strive to apply the EBPs when teaching their students. For example, the current study proved that the POV-VM intervention method helped develop the students’ addition skills. Accordingly, practitioners should use it for students who have difficulties in addition skills. To do it effectively, they must know how to apply the
POV-VM to students with LD. First, they should target the addition skills (e.g., two digits plus two digits). Second, they should have the equipment (e.g., iPad or iPhone). Next, they should make the video clip using the POV-VM steps. The camera angle is shown at the child’s eye level and shows only what the child might see within the context of the targeted skill (from her or his own viewpoint). The child might view a specific setting or a pair of hands to complete the addition skill. For example, a child will watch a video of a skilled model’s hands solving step-by-step the addition problems with regrouping. After making the video clip, the practitioners should arrange the environment for watching the video (e.g., free of distractions and noises). Next, the practitioners ask the student to watch and imitate the video. Finally, the practitioners should praise the student. Based on the participants' positive answers to the social validity questionnaire in the current study, the participants' opinions were highly acceptable and satisfied with the POV-VM method.

**Recommendations for Future Research**

This study serves as a knowledge expansion and extension of previous studies on evaluating the effectiveness of using POV-VM to improve the addition skill of students with LD. Moreover, this study proposes several recommendations for future research. First, future research could replicate this study with a larger sample of Saudi students with LD and recruit students from different socioeconomic statuses and cities.

Second, more studies are needed to understand the effect of POV-VM on all math skills, such as subtraction and multiplication for students with LD. Previous studies only focused on limited skills such as algebra and fractions. Moreover, a variety of academic areas (e.g., writing and reading) should be investigated by utilizing POV-VM to teach children with LD.
VIDEO MODELING AND STUDENTS WITH LD IN MATHEMATICS

Third, researchers should ensure that studies include the generalization phase. When the future researcher implements the generalization phase and shows positive results, teachers and parents will be encouraged to increase the implementation of POV-VM. Without this phase, it is not known whether the students with LD are able to generalize the skill in various settings.

Lastly, researchers should compare different variations of VM interventions and their effectiveness with students with LD. In addition, they should compare different variations of technologies that are used for VM intervention (smartphones, tablets, iPods). Knowing the impact of all these types will increase VM's effectiveness in teaching math skills to students with LD.

**Recommendation for Policy**

The MOE should consider some essential recommendations in developing the field of special education in KSA. Based on the current study, these recommendations will benefit students with LD. First, the MOE should include EBPs (such as POV-VM) in universities' education curricula in KSA. Teaching EBP in universities will make teachers familiar with how it applies to students with LD. For example, the POV-VM method is considered one of the solutions for students who have difficulties learning the addition skill. Also, training programs should be provided for current teachers to develop their skills in teaching EBP methods in their classrooms. This additional training is positive in the interest of students with LD.

Second, the MOE should financially support both LD classrooms and general education classrooms. For example, the MOE should provide devices (e.g., iPads) for students to watch videos showing the addition skill. Also, these devices should have professionally filmed video clips ready when using the POV-VM method to teach the addition skill to all levels of elementary students. For example, a clip would show a professional person explaining how to
calculate two digits plus two digits (e.g., 12+10) or show a more challenging addition skill (e.g., 77+68), depending on the level of the student. The teacher would only choose the skill required to be taught and then ask the student to watch and imitate it.

Finally, the MOE should motivate researchers (e.g., financially) in KSA to replicate and expand the current study. For example, the MOE should provide valuable money for researchers searching for the effectiveness of using POV-VM to teach subtraction skills to elementary students with LD. Supporting researchers to expand previous studies helps to develop the field of special education, precisely the LD field.

**Conclusion**

The current study is the first in which POV-VM intervention was used to improve the mathematical skill of students with LD in KSA. It proved that using POV-VM is an effective intervention to help improve addition skills for elementary school students in KSA. The three students improved their performance of addition skill after the intervention. They also maintained the increase two weeks after the intervention. These positive results are consistent with previous studies in which POV-VM was used to develop other mathematics skill of students with LD. Additional research is needed to address the limitations to this study. Recommendations are provided to help guide future research to close the gaps in current and previous studies.
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Appendix A

Regrouping Steps

<table>
<thead>
<tr>
<th>Regrouping Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Add values found within the ‘ones’ column</td>
</tr>
<tr>
<td>2. Write ones values in the ‘ones’ column</td>
</tr>
<tr>
<td>3. Write tens digits above the ‘tens’ column</td>
</tr>
<tr>
<td>4. Sum the values found within the ‘tens’ column and include the numbers carried</td>
</tr>
<tr>
<td>5. Write the values found within the ‘tens’ column</td>
</tr>
</tbody>
</table>
Appendix B

Steps to Access the Video Clip

<table>
<thead>
<tr>
<th>Steps</th>
<th>Actions</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>![Headphones]</td>
<td>Put on headphone</td>
</tr>
<tr>
<td>2</td>
<td>![iPad]</td>
<td>Turn on the iPad</td>
</tr>
<tr>
<td>3</td>
<td>![iPad with iMovie app]</td>
<td>Access the clip (iMovie app)</td>
</tr>
<tr>
<td>4</td>
<td>![Child with headphones]</td>
<td>Watch the clip</td>
</tr>
<tr>
<td>5</td>
<td>![iPad]</td>
<td>Turn off the iPad</td>
</tr>
</tbody>
</table>
Appendix C

Data Recording Sheet

<table>
<thead>
<tr>
<th>Student number:</th>
<th>__________</th>
<th>Phase: _______</th>
<th>Session: ________</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sessions/Date</th>
<th>Number of correct addition problem</th>
<th>Number of correct digits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 3 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 4 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 5 - Date:</td>
<td></td>
<td></td>
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<tr>
<td>Session 6 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 7 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 8 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 9 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 10 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 11 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 12 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 13 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 14 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 15 - Date:</td>
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<tr>
<td>Session 16 - Date:</td>
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<tr>
<td>Session 17 - Date:</td>
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<tr>
<td>Session 18 - Date:</td>
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<td></td>
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<tr>
<td>Session 19 - Date:</td>
<td></td>
<td></td>
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<tr>
<td>Session 20 - Date:</td>
<td></td>
<td></td>
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<tr>
<td>Session 21 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 22 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 23 - Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 24 - Date:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Addition Assessment Worksheet

Student number: _______________ Phase: _________ Session: _______
Appendix E

Participant Social Validity Questionnaire (Likert Scale)

Student number: ________________

*Please circle a number between 1 (strongly disagree) and 5 (strongly agree).*

<table>
<thead>
<tr>
<th>ID</th>
<th>Statements</th>
<th>Strongly Disagree</th>
<th>Disagree (2)</th>
<th>Neutral (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
</tr>
<tr>
<td>1</td>
<td>It was easy to use the videos displayed on an iPad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I found it enjoyable to watch videos from an iPad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I found the practice sessions very helpful after watching the video clips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I would like to improve my math skills going forward using the video clips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments
Appendix F

Treatment Integrity Checklist

<table>
<thead>
<tr>
<th>Planning Steps</th>
<th>Yes</th>
<th>No</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organize the learning environment (resource room) for video viewing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Put all materials needed on the student's table (assessment worksheet, iPad, pencils, eraser, and paper outlining the steps to access the video clip)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ask the student to come for the intervention phase during his math class.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ask the participant to watch the clip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Praise the student verbally (good work or well done)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix G

Student’s Assent Form- English Version

Duquesne University
Institutional Review Board
Protocol #: 2022/10/8
Verified On: 11/21/2022
Expires: No Expiration Date

DUQUESNE UNIVERSITY
600 FORBES AVENUE • PITTSBURGH, PA 15282
STUDENT ASSENT TO PARTICIPATE IN A RESEARCH STUDY

WHAT AM I BEING ASKED TO DO?
I would like to invite you to participate in this research study to assist students with learning disabilities aged 7 to 12 to improve their math skills, especially the addition skill. Please continue reading if you find this interesting.

WHO IS DOING THE STUDY?
Tirad Alsululi, Ph.D. Candidate from Saudi Arabia attending Duquesne University in Pittsburgh, PA, USA.

WHAT IS A STUDY?
A study assists us in learning new information. We can test new concepts and methods of doing things. For example, in this study, we will utilize a video to attempt to learn a new skill or improve existing ones.

WHY IS THIS STUDY BEING DONE?
We are doing this study to help children improve their ability to solve addition problems better.

WHO IS BEING ASKED TO PARTICIPATE?
Participants in this study will be students aged 7 to 12 from your school who need to improve their math skills.

WHAT DO I HAVE TO DO?
If you are interested in participating in this study, I will ask you to: (a) work with the researcher for about three months, (b) watch a video clip that will teach you how to solve addition problems, and (c) solve a math worksheet involving some addition problems (e.g., 23+19). There may be times when you don’t know how to solve the problem, that is fine.

WHERE WILL THE STUDY HAPPEN AND HOW LONG WILL IT TAKE PLACE?
The study will happen during the school day in the resource room, once a day, three times a week for approximately three months.

COULD I BE HARMED BY PARTICIPATING IN THIS STUDY?
No harm comes from participating in this study.

WHAT SHOULD I DO IF I AM UNCOMFORTABLE WITH ANY PART OF THE STUDY?
If you feel uneasy, you are free to discontinue participation at any moment.

WILL I BE PAID TO DO THIS STUDY?
No, you will not be paid.

ARE OTHER PEOPLE GOING TO KNOW WHAT I DID OR SAID?
VIDEO MODELING AND STUDENTS WITH LD IN MATHEMATICS

What will you do or say in this study will be very confidential. Also, we will never reveal your name or talk about you in such a manner that someone may deduce who you are or what you do in the study. We will keep everything secure and private.

CAN I QUIT IF I WANT TO?
Yes, you are free to stop at any moment. If you begin and decide you no longer want to do it, just inform the researcher or the teacher, or inform your parents so they may inform us. No one will be angry with you if you decide to stop. It's all up to you.

CAN I FIND OUT WHAT YOU LEARN FROM THE STUDY?
We can give you a description of what occurred in this research after it is completed. Don't hesitate to contact the researcher or have a parent email the researcher if you would like a copy.

Okay, would you like to be part of this study?
If you understand everything on this paper, including that you are under no obligation to participate in the study and that you may stop working with the researcher at any moment, circle the YES. Please circle NO if you do not want to participate in the research. Thank you so much.

YES

NO

__________________________   __________________________
Child’s name and signature   Date

__________________________   __________________________
Researcher’s signature   Date
Appendix H

PARENT CONSENT TO PARTICIPATE IN A RESEARCH STUDY

DUQUESNE UNIVERSITY
600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

PARENT CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE:
Examine the Effectiveness of Using Point of View Video Modeling (POV-VM) on Mathematics Improvement in Students with Learning Disabilities (LD) in Saudi Arabia

WHO IS DOING THE STUDY?
Tirad Alsuliti, Ph.D. Candidate in Special Education, School of Education at Duquesne University, alsuliti@duq.edu
ADVISOR: Reva Mathieu-Sher, Ed.D., BCBA, Assistant Professor of Special Education, Duquesne University, mathieusherr@duq.edu

WHAT IS THE PURPOSE OF THIS LETTER?
This letter provides information to assist you in deciding whether to allow your child to participate in the study. This letter describes the research and addresses frequently asked questions. Before determining whether to permit your child to participate, please review the following information and contact the researcher with any questions. This form constitutes permission for your child to participate in this intervention study.

SOURCE OF SUPPORT (if applicable):
This study is not supported by a grant.

WHY IS THIS RESEARCH STUDY BEING DONE?
This invitation is for your child to participate in this research using video modeling intervention to improve mathematics skills for children with learning disabilities. This study aims to help Saudi Arabian children improve their mathematical skills, specifically addition skills. Participants in this study must be children enrolled in the school's learning disability program, be between the ages of 7 and 12, and have difficulty in math skills, especially in addition skills.

WHAT WILL MY CHILD BE ASKED TO DO?
If you agree to allow your child to participate in this study, the researcher will ask your child to perform the following:
1. Your child will read and sign the child assent form.
2. The researcher will ask your child to watch a video that shows how to solve the addition problems by using the regrouping method.
3. The researcher will give your child a worksheet, which includes addition problems, and then ask him to solve them.
4. The researcher will take the worksheet, and then praise your child verbally after completion or after the time has concluded.

HOW DOES THE REWARDS SYSTEM WORK?
There will be no tangible reward. Instead, if your child's math skills improve, they will feel more confident and automatically enhance their academic level. Also, the child will be praised verbally after each session. level.

Duquesne University
Institutional Review Board
Protocol #: 2022/108
Verified On: 11/21/2022
Expires: No Expiration Date
VIDEO MODELING AND STUDENTS WITH LD IN MATHEMATICS

WHERE WILL THE STUDY HAPPEN AND HOW LONG WILL IT TAKE PLACE?
The research will take place during school hours, and it will be completed three times a week for
around 20 minutes each time. The study will be about four months.

WHAT ARE THE RISKS AND BENEFITS OF THE STUDY?
There are no foreseeable risks in this study other than those that the child would encounter
routinely as part of their school day. The anticipated benefit to your child is an opportunity to
learn how to solve addition problems by using the regrouping method.

WILL MY CHILD BE PAID FOR TAKING PART IN THIS RESEARCH STUDY?
No, your child will not be compensated.

ASSURANCE OF CONFIDENTIALITY
Your child's participation in this research, as well as any personal information you or your child
contribute, will be kept entirely secret at all times. No information about your child's
participation in this study will be shared with anyone else. Your child's true name will not appear
in any of the study materials. Your child's information will be kept private. Instead, a pseudo
name will be chosen at random and used with your child's information. All information will be
kept in a locked cabinet accessible only to the researcher. Following the end of the research, all
data will be destroyed.

RIGHT TO WITHDRAW AT ANY TIME
You are not obligated to offer your child's consent to participate in this research. You may
revoke your consent at any moment by informing the special education teacher, researcher or the
supervising advisor in writing or by email at any time during the process.

SUMMARY OF RESULTS
On request, a summary of the study findings will be provided at no cost.

VOLUNTARY CONSENT:
I have read the above statements and understand what is being requested of me and my child. I
also understand that my child’s participation is voluntary and that I am free to withdraw my
permission for my child at any time, for any reason.
On these terms, I agree that I am willing to allow my child to participate in this research project.
I understand that should I have any further questions about my child’s participation in this study, I may
contact [Tirad Alsalali at alsalalii@duq.edu, +966561055598 or the project advisor, Dr. Reva Mathieu-
Sher, at mathieusherr@duq.edu.
If I have questions regarding the protection of human subject issues, I may contact Dr. David Delmonico,
chair of the Duquesne University Institutional Review Board, at +1 412-396-4032 (U.S. phone number).
A copy of this form will be given to you to keep for your records.

Parent/Legal Guardian’s Signature

Date

Child’s Name

Date

Researcher’s Signature

Date
Appendix I

Approval Letter from the Ministry of Education to Conduct Research Study

الموضوع: الوافقة البدنية على إجراء دراسة علمية

الدكتور طارق بن محمد السلولي
جامعة دوكنسون الأمريكية (Duquesne University)

السلام عليكم ورحمة الله وبركاته

بناءً على الاستدعاء المقدم لسعادة مدير التعليم بمحافظة بيشة بتاريخ 1444/3/26 الهـ، والمرفق به نموذج إعداده من المشرف على مرشح خدمات الابتعاث بوزارة التعليم، وталبتم الفوعة الموافقة المبدئية لإجراء الدراسة (دراسة فعالية استخدام نمذجة الفيديو في تطوير مهارة الرياضيات لدى الطلاب الذين يعانون من صعوبات التعلم في المملكة العربية السعودية).

عليه فإنه لا منع من تطبيق الدراسة بمدارس إدارة التعليم بمحافظة بيشة وفق اللوائح والأنظمة.

وتنبأوا تحياتي.

 direktor التخطيط والتطوير

صالح علي آل هرحان
Appendix J

Approval Letter from the School

Recipient's Name

Date: 8/8/1444

The school authority of the Ministry of Education

Approval letter from the School

In the name of the most merciful and most compassionate Lord.

Sauda al-ala and may peace and mercy be upon you.

We inform you that the researcher, Dr. Mohammad Abboud, from Nasser al-Samia School, has submitted a research titled "Dr. Thesis: The use of video modeling in teaching mathematics in the United States," in the Ministry of Education at the level of 1444 Hijri, which was approved during the period from 27 July to 8 August 2022.

We congratulate the researcher and thank him for his efforts and continuous efforts to achieve success.

Director of the School

[Signature]

Nasser al-Samia School