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Using Video Prompting to Teach Math Skills to Adolescent Students with Specific Learning Disabilities (SLD) via iPad

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A thesis submitted to the faculty of
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Master of Science

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ABSTRACT

Using Video Prompting to Teach Math Skills to Adolescent Students
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A plethora of research exists suggesting video-based interventions such as video modeling (VM) and video prompting (VP) assist students with severe/profound disabilities, such as autism and intellectual disabilities, to learn academic skills. This study used a single subject multiple-baseline-across-subjects design to evaluate if a VP intervention on a functional, academic math skill had similar effects for adolescent students with mild/moderate specific learning disabilities (SLD). Five high school students (three female and two male) aged 16-17 viewed the video on an iPad to find out about how much money an item would cost if it were a certain percentage on sale. A functional relationship between the intervention and acquisition of the steps necessary to complete the task was discovered. In addition, some students maintained the skills as demonstrated by correctly answering most given word problems when given a post-test. Implications for practice and further research are discussed.

Keywords: specific learning disability, SLD, math instruction, video modeling, video prompting, iPad, Common Core

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DESCRIPTION OF THESIS STRUCTURE

The structure of this thesis, *Using Video Prompting to Teach Math Skills to Adolescent Students with SLD via iPad*, is presented in a dual/hybrid format. This means that both traditional and journal publication formatting requirements are met.

The preceding pages of this article meet university standards for thesis submissions. The later pages are presented as a "journal-ready" article that meets most educational peer-reviewed journal style requirements, so that this article is ready for publication. Some journals request that tables be submitted at the end of the main text such as the *Journal of Learning Disabilities*. This is the reason for the placement of the tables and graphs appearing at the end of the article as opposed to throughout the journal-ready manuscript. There is a full review of literature is included in Appendix A. The consent form for research and the data collection form are included in Appendix B and C, respectively.

Introduction

The National Center for Learning Disabilities (NCLD) (2014) reported that about 2.4 million students in the United States are diagnosed with a specific learning disability (SLD). The NCLD provided additional information on some of the academic outcomes of these students. Nearly half of all secondary students diagnosed with SLD perform more than three grade levels below their actual grade in core academic skills such as reading and math. Also, 20 percent of students with SLD drop out of high school, whereas only 8% of general education students drop out. According to the National Center for Education Statistics (2011), in the 2008-2009 school year, almost 50,000 students with SLD dropped out of high school. With the high prevalence of SLD, it is probable that most people know someone who has SLD. It is therefore important that parents, friends, educators, and society at large do everything possible to ensure students with SLD feel successful and empowered to learn by providing them with educational options. As this happens, it is safe to assume more students with SLD will graduate with high school diplomas and move on to achieving a higher quality of life and be contributing members of the community. An evidence-based practice that many educators are using with students as a means to teach and differentiate instruction is video modeling (VM).

Video Modeling

"Video modeling is a technique that involves demonstration of desired behaviors through video representation of the behavior" (Bellini & Akullian, 2007, p. 266). VM has its roots in Albert Bandura's social learning theory, which describes learning as a cognitive process that occurs through observation or direct instruction combined with operant conditioning or reinforcement (Bandura & Walters, 1963). Observational learning occurs when (a) the observer is attentive to the modeled behavior, (b) the behavior is retained or remembered by the observer,

(c) the observer organizes and compartmentalizes the behavior, and (d) the observer is motivated to carry out the behavior (Grusec, 1992). Many behaviors are acquired through observational learning when people watch a model. Modeling is effective in many settings as an instructional tool to teach desired behaviors to all individuals, including those with disabilities (Regan & Berkeley, 2012). Modeling has converged with technology to expand the reach and influence of both on teaching students with disabilities with the use of VM procedures.

As an evidence-based practice, VM has shown positive effects for teaching students with disabilities a wide variety of skills (Johnson, Blood, Freeman, & Simmons, 2013). With VM, a video of a desired task is shown in its entirety to a student. After watching the whole sequence of behavior, the student is then expected to perform the target behavior from start to finish (Mason et al., 2013). There are different kinds of VM. Video Self-Modeling (VSM) is when a student watches a video of himself performing the desired behavior. It is made through recording a student performing a behavior. Through editing, prompts are removed to make it seem as if the student can perform the behavior without assistance (Santini, 2007). The term "video modeling" typically refers to when the student watches a video of some other person modeling the behavior (e.g., peer, teacher, paraeducator) (Mason, Ganz, Parker, Burke, & Camargo, 2012). Point-of-View Modeling (PVM) is when a student views a film depicting the desired behavior and what the performance would look like from the student's perspective (Tetreault & Lerman, 2010).

VM can be implemented by using traditional VM procedures or video prompting (VP). As mentioned, in VM a model is recorded performing a target behavior and then the video is shown from start to finish to the student. The student is then expected to execute the target behavior in its entirety. VP occurs when the student is shown separate clips of a model performing a target behavior piece by piece or one step at a time. The student is then given the opportunity to perform the task-analyzed behavior before the next step is presented (Cannella-Malone et al., 2011).

Educational Application

There are many uses and benefits that VM and VP have on educational skill acquisition for individuals with disabilities. When discussing the benefits of this evidence-based practice, VM can also be replaced with VP, because of the similarities between both practices. Functional relationships have been established with VM and attaining behavior skills (Blood, Johnson, Ridenour, Simmons, & Crouch, 2011), social skills (Charlop, Dennis, Carpenter, & Greenberg, 2010; Sancho, Sidener, & Reeve, 2010), and transition skills (Allen, Wallace, Renes, Bowen, & Burke, 2010; Johnson et al., 2013; Mechling, Ayres, Foster, & Bryant, 2013; Sigafoos et al., 2007).

Equally important, VM has been used to show improvements in academics such as math skills with students across various disabilities. Burton, Anderson, Prater, and Dyches (2013) developed a VM intervention for students with autism. The target skill as to estimate the amount of money it would take to pay for a given item and how much to receive in change. All four participants reached 100% steps completed correctly for at least two of the four intervention sessions. The researchers determined their findings support a functional relationship between the VM intervention and acquisition of math skills.

VM interventions for students with SLD and those at risk of academic failure have also demonstrated positive results. Decker and Buggey (2014) conducted a study to evaluate the effect of a VM intervention on reading fluency for elementary-aged students (ages 8 years 7 months to 12 years 1 month) with SLD. During intervention sessions, the student watched the video of himself or a peer with acceptable reading fluency. After viewing the video, the student was expected to read a passage at the participating student's reading level. The dependent variable was the number of words read correctly per minute. A multiple baseline design across participants was used to assess VM effects on acquisition of reading fluency. Baseline results showed steady trends for all participants. For example, one student's baseline was between 40 and 60 words read correctly per minute. After the reading fluency VM intervention was introduced, the student quickly made gains in words read correctly per minute between phases. For the student mentioned previously, intervention and maintenance data showed over 100 words read correctly per minute for all sessions. The researchers also evaluated which VM procedure was more effective, VSM or VM with other as model. Outcomes showed that both were effective at teaching reading fluency to the participants. A functional relation can be inferred from the researchers' findings.

Hitchcock, Prater, and Dowrick (2004) used VM to increase reading fluency for elementary-aged students with SLD. The first grade students read a short story passage at their reading level. The students were timed for one minute and correct words per minute were recorded. Baseline results for one of the students with SLD ranged from between about 20 correct words read per minute to about 50 correct words read per minute with most sessions resulting in the 30 to 40 correct words read per minute range. After baseline, the students were introduced to the VSM intervention combined with tutoring in which the student watched an edited video of himself reading fluently. During intervention phases, all students made increases in the number of words read correctly per minute. For the student mentioned previously, an increase to around 90 words read correct per minute was observed. This study is further documentation of a functional relation between the independent and dependent variables.

VM techniques have also been used to increase academic skills for at-risk students. Ayala and O'Connor (2013) used VSM to increase reading abilities, specifically areas of reading that deal with phonemic awareness such as blending, segmenting, and decoding words and reading sight words, for students in the first grade (about six to eight years of age). Each student was filmed as he or she participated in reading instruction in a private classroom with an adult tutor. The student worked on activities such as blending consonant, vowel, consonant (cvc) words similar to words like /c/ /a/ /t/. The tutor directed the student to identify the sounds in the word. If the student needed assistance, the student was prompted until he did the activity correctly. Afterwards, the videos were edited to show the student performing the target behavior with accuracy. The final video included five decodable words and five sight words. Each student watched a video of himself four times per week. After receiving the intervention, they were expected to perform the reading skills they were just taught. The method used was a single subject multiple baseline across participants. The students generally showed steady baseline results across the different domains. Out of nine students, five students showed an improving trend in decoding words within three sessions. Similarly, three students showed a clear increase within four to five sessions, and one student took about eight sessions. The researchers determined that sight word skills increased through the VSM intervention for three of the students after two sessions. For most of the other students it took three to four sessions and for two students it took six to nine sessions. All participants improved in decoding and sight word recognition reading abilities. In addition, most of the students maintained or even improved their highest score two weeks after the intervention was removed. This study established a functional relation between the independent variable (VSM) and dependent variable (decoding and sight words).

Purpose of Study and Research Questions

Much of the research using VM and VP involves students with severe disabilities, like autism spectrum disorder, serious emotional disturbance, and intellectual disability. Very few studies address students with mild/moderate disabilities such as SLD. O'Brien and Wood (2011) said, "Research on...applications of video modeling for students with learning disabilities is less extensive" (p. 27). Also, there is an extensive research base establishing the effectiveness of using VM for elementary-aged students, and some evidence to support using VM with middle school-aged children. There is a dearth of research using VM interventions with high school-aged students.

The purpose of this study was to investigate the effects of a VP intervention on high school students with SLD learning an academic, functional math skill. Specifically, this study used a VP intervention recorded with another person as model and PVM techniques to teach percentage and cost skills to adolescent students in high school with SLD.

Widely influencing education are the Common Core State Standards, known as the "Common Core," that have been adopted by 43 states, the District of Columbia, and four United States territories (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). This study addressed the Common Core by helping students with SLD access the standards and develop the pre-skills necessary to potentially reach the standards at the student's grade level. Identifying "percent" and being able to determine percent of a quantity as a rate per 100 is first mentioned in the Common Core as a Grade 6 standard. The specific skill this study addressed is a Common Core State Standards for Grade 7. The standard, CCSS.MATH.CONTENT.7.RP.A.3, reads, "Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error." Although this is a Grade 7 skill, student knowledge of percent is essential to reach higher-level high school mathematics Common Core standards such as Standard F-IF.8.b., F-LE.1.c., and S-ID.4 (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). As mentioned previously, most students at the secondary level with SLD perform three grade levels below their peers in academic subjects, which makes this particular Common Core standard appropriate for high school aged students with SLD.

This study investigated the following experimental questions:

1. Can adolescent students with SLD use a VP intervention delivered via iPad to correctly complete the steps necessary for solving percent-cost word problems?
2. After receiving the intervention, can adolescent students with SLD independently solve percent-cost word problems correctly without using the VP instruction?
3. How do the participants and teachers rate the VP intervention?

The latter question assessed social validity in order to "demonstrate that the independent variable under investigation is perceived as socially acceptable and feasible by typical stake holders" (Spear, Strickland-Cohen, Romer, & Albin, 2013, p. 357). This means, in order for the intervention to be considered valuable, it must be received well by educators, administrators, students, and parents even if the research shows positive effects of the independent variable.

Method

Participants and Setting

Three female and two male students, given the pseudonyms of Jeanie, Elaine, Clay, Krista, and Tucker, were selected based on predetermined criteria and teacher recommendation to participate in the study. Selection criteria were based on the following areas: (a) has a specific learning disability classification as identified by the Individuals with Disabilities Education Act, (b) high school enrollment, (c) similar full scale intelligence quotient (IQ) between standard scores of 85 to 115, (b) similar Broad Math score from the Woodcock-Johnson III: Tests of Achievement® between standard scores of 75 to 85 (Woodcock, McGrew, & Mather, 2001), (c) similar results from curriculum-based math assessment that uses the Quantile Framework (Scholastic Inc., 2012), (d) has at least one math improvement goal in the current Individualized Education Program (IEP), (e) has a reading comprehension level of at least grade 5.0 as determined by curriculum-based reading comprehension assessment, (f) has access to or owned a cell phone with a calculator, and (g) parental permission to participate in the study. More specific information on the participants' cognitive and academic abilities is shown in Table 1.

<Insert Table 1>

All students attended the same suburban high school located in the Western United States and participated in a resource math class every other day because of the school's block scheduling system. The participants, three female and two male, were given the pseudonyms of Jeanie, Elaine, Clay, Krista, and Tucker. Student assent and parental consent was obtained for each participant. Approval from the university and school district institutional review boards for research involving human participants was obtained. More information about each student follows.

Jeanie. Jeanie was a 16-year-old, grade 11 student. According to the Woodcock-Johnson III: Tests of Cognitive Abilities®, Jeanie scored in the average range with an IQ standard score equivalent of 97. Her academic testing suggested she would benefit from specialized math instruction with a Broad Math standard score of 78, which is in the below average range. Her most recent Quantile score was a 720, which puts her math skills at around a grade 5.5 level. Jeanie also had a math improvement goal in her IEP.

Elaine. At the time of the study, Elaine was a 16-year-old, grade 11 student. Elaine's cognitive scores reported indicated an average IQ standard score equivalent of 103. According to the Woodcock-Johnson III: Tests of Achievement®, Elaine had below average math skills with a standard score of 84 in Broad Math. Elaine's Quantile score was equivalent to a math skills grade 3.5 level. Elaine had a math improvement goal in her IEP.

Clay. Clay was a 16-year-old, grade 11 student. Information gathered from Clay's cognitive testing showed a full scale IQ standard score of 87. This is a low average score, but still falls within the first standard deviation. Like other participants, Clay also scored below average in Broad Math with a score of 81. He scored a 475 Quantile, which suggests his math skills are at around a grade 4.0 level. He had a math improvement goal on his IEP.

Krista. Krista was a 17-year-old, grade 11 student. Krista's cognitive testing scores showed an IQ standard score of 96, which is within the average range. A Broad Math score was not found in Krista's testing history, but her Math Reasoning score was 82. According to her most recent Quantile score, her math skills were at around a grade 6.0 level. This score is below average. She had a math goal on her IEP.

Tucker. Tucker was a 16-year-old, grade 11 student throughout the research. Similar to Clay's full scale IQ, Tucker scored a standard score of 86, which also still falls within the first standard deviation. According to the Woodcock-Johnson III: Tests of Achievement®, Tucker scored in the below average range with a Broad Math standard score of 77. He had a Quantile score of 735. This score puts Tucker's math skills at around a grade 5.5 level. Tucker also had an improvement goal in math listed in his IEP.

All participant selection criteria came from existing data. No new assessment was given to determine eligibility for the study.

Materials

All videos were recorded using an iPad 2. The videos were edited and put together using iMovie 2011 (version 9.0.9). The edited videos were uploaded to the iPad VideoTote application (The Prevention Group, 2012) where the researchers segmented the videos for VP instruction.

One VP video was used throughout the entire study that showed a model similar in age to the students showing how to successfully complete a percent-cost word problem. The word problem used in the video was, "A shirt is normally $19.99. It is on sale for 30% off. What is the sale price of the shirt?"

At the beginning of each session, the student received a percent-cost word problem similar in wording to the word problem solved in the VP video. Thirty word problems were developed and the order of the questions was randomized for all participants. They were also provided with a pencil and access to a calculator (for baseline sessions).

Students used their own phones during intervention trials. Any phone with access to a calculator was acceptable.

Dependent Measure and Data Collection

The first dependent variable in the study was acquiring the skills necessary in order to complete the math word problem. A task analysis shown in Table 2 was used to collect data during all sessions. Percentage correct was calculated by dividing how many steps were completed correctly by the number of total steps. Participating students only received the iPad

VP instruction during intervention. The participating students were allowed to watch the video segment as many times as needed before completing the step without the step marked as completed incorrectly.

<Insert Table 2>

The second dependent variable was correctly answering percent-cost word problems. Data on this variable was collected through pre- and post-tests. The pre-test consisted of five percent-cost word problems written in the same style as the one used in the VP video. The post-test was identical to and contained the same word problems as the pre-test. A percentage correct was determined by how many questions were answered correctly divided by five.

Two sessions were held each data collection day. Because of the block scheduling data collection occurred either two or three times per week. The students were pulled out of their math class into a quiet room. Intervention sessions lasted approximately 10 to 15 minutes. There were no rewards given for participating in the study.

Experimental Design

A multiple baseline across participants design was used to determine whether or not a functional relation between the independent variable and the dependent variable existed (Kennedy, 2005). The independent variable was systematically introduced to different participants across different baselines. Once one participant reached criterion, which was 100% steps completed correctly for five consecutive sessions, the intervention was introduced to the next randomized participant. Baseline and intervention probes were conducted on participants as they started the intervention.

Data comparing baseline and intervention phases were visually analyzed for changes in level, trend, and variability. The objective of the research was to show a functional relationship between the dependent variable (percent of steps completed correctly) and independent variable (VP intervention) by observing changes. Kennedy (2005) explains, "If changes in the dependent variable occur only when the independent variable is introduced, then a functional relation is demonstrated" (p. 152).

Procedures

Pre-Assessment. Before participants started baseline, each was required to complete a pre-assessment phase. This consisted of demonstrating iPad competency, rounding up of numbers, and completing a pre-test.

Participants were considered knowledgeable if they could navigate basic features of the iPad and perform the required actions when asked (e.g., access a given application, play/pause videos, turn volume up/down). A checklist was used to assess knowledge. Students needed to score 100% in order to participate in the study.

To make solving the percent-cost word problems accessible for participants, the researchers determined it would be in the student's best interest to be able to round numbers up to the next highest number (this could also potentially give a little bit of room when tax is involved). All prices involved with the study had between 50 and 99 cents. In addition, no number exceeded 300. Students needed to have prior knowledge of rounding up in order to participate in the study. To assess this, students filled out a worksheet consisting of ten questions requiring the student to round up to the next highest number. Students had to score 100% to continue with the study.

Also as a pre-assessment measure, a pre-test was given to students to evaluate whether or not students already had the skills necessary to correctly answer percent-cost word problems. If students knew how to answer the questions, it was an indictor they did not need the VP intervention. There were five questions on the pre-test and they were allowed access to all items needed to complete the word problems (e.g., pencil, eraser, and calculator). If any of the students answered at least one question correct, they were not considered for further participation in the study. No students selected answered the questions correctly.

Baseline. When pre-assessment standards were met, the participant moved into baseline. In baseline, the participant was pulled out of their resource math class into a quiet room. The participant was given a randomized percent-cost word problem. He or she had access to a pencil, eraser, and calculator and was given the verbal prompt, "Solve the problem." The task analysis was used to evaluate the percentage of steps performed correctly (see Table 2). Once a participant established a stable baseline with low variability, set at no more than 10% difference between all baseline points for at least five consecutive data points, the participant was eligible to move into the intervention phase. Baseline probes were conducted with all participants that had not yet moved into intervention whenever a new participant entered into intervention.

Intervention. Before moving into intervention, the participant was taught how to find the correct application and which video to choose on the iPad. The participant was then told that the video will pause at different steps of the skill and before the participant could move on to the next step, he or she needed to press anywhere in the middle of the screen until the video was completely finished.

During the intervention, participants had access to a pencil, eraser, calculator, and the iPad with the VP video. The researcher read the following, "You will now watch a video that will help you learn a skill. The video will pause after each step in the skill. When it pauses, you will need to complete that step you just watched. You can watch the video segment as many times as you need to by pressing the back button once at the bottom of the screen. After you complete the step, press anywhere in the middle of the screen to continue to the next step. You will continue doing this until you learn the skill." After receiving the instructions, the participant was given a randomized percent-cost word problem and told, "Solve the problem." The task analysis data sheet based on the steps identified in Table 2 was filled out as the participant worked through the word problem. The participant was required to reach criterion at 100% for at least five consecutive sessions. Intervention probes were conducted with all participants that had already been in the intervention phase whenever a new participant started intervention.

It was considered acceptable if the participant needed an additional verbal prompt after receiving the word problem to start the VP intervention. If it appeared that the participant did not know what to do when the video paused after at least 5 seconds of wait time, the student was told, "Now you do the step you saw in the video." These reminders were not counted against the participant when scoring.

Post-Assessment. A month after a participant reached criterion in the intervention phase, he or she was given a post-test. All participants received an intervention probe with the VP intervention the day prior to taking the post-test. This assessment was the exact same as the pre-test and had the same procedures. The post-test data were used to compare answers with the results from the pre-test to determine if the VP intervention taught adolescent students with SLD how to independently obtain the correct answer for percent-cost word problems when the VP intervention was not made available to them.

Although the main reason post-assessment results were reported was to determine either "Yes, the student can do the skill," or "No, the student can not do the skill," the participants were still scored according to the task analysis to determine if the steps were maintained over time.

However, scoring procedures were a bit different than they were for the intervention phase. In post-assessment, the participants could switch the order of some steps and it would still be considered correct. For example, a participant could round up the cost of the original item and calculate the percent in decimal form before accessing the calculator, and those steps were counted correct. Also, instead of raising their hand to offer an answer to a teacher, because it was in a worksheet format, it was acceptable if a participant just wrote the final answer.

Interobserver Agreement and Treatment Fidelity

An observer was present to record data during all sessions of the study. The first author, a classroom teacher, took the role of primary researcher. Consent was obtained to video record the participants during baseline and intervention phases. A second observer watched the recorded videos and collected observational data for 50% of all sessions during baseline and intervention phases to determine interobserver agreement. The second observer was an undergraduate student in her junior year at a nearby university majoring in secondary education, English teaching. The sessions were video recorded and the second observer watched the videos and filled out a data collection form after the session had already occurred. An interval agreement approach was used to validate the first observer's results. Interval agreement requires each step in the task to be recorded as either completed independently or not completed independently. If both observers recorded a score as completed, it was marked as an agreement. If both observers recorded a score as not completed, it was marked as an agreement. Any variation was marked as a disagreement. Inter-observer agreement was then found by dividing the total number of agreements by the sum of the total number of agreements and total number of disagreements. The number was then multiplied by 100 to get a percentage of inter-observer agreement for each session (Kennedy, 2005). Sessions used for interobserver agreement were then averaged together to obtain an overall interobserver agreement percentage. Using this approach, interobserver agreement was reported at 100%.

Treatment fidelity measures were in place to ensure the researchers administered all areas of the study correctly and with consistency across all participants. The researchers completed a fidelity checklist for all pre-assessment/post-assessment and baseline phases. A detailed fidelity checklist was completed for at least 50% of all intervention sessions for each participant. Fidelity checklists were also completed for all baseline and intervention probes.

Results

A multiple baseline across five participants design was used to evaluate effects of a VP intervention via an iPad on percent-cost math performance of adolescent students with SLD. Data analysis shows a functional relationship between VP and learning the steps required to solve percent-cost word problems for all five participants. All participants completed 0 of the 10 steps correctly for all sessions in baseline. Once the intervention was introduced, four out of the five participants immediately completed 100% of the steps correctly within the first session. The most sessions it took for a participant to reach criterion at 100% for five consecutive sessions was 13 sessions. Figure 1 shows the effect the VP instruction had on the percent of steps completed correctly. A mean percentage of steps completed correctly for both baseline and intervention phases are shown in Table 3.

<Insert Figure 1>

Results of Five Participants

The study provides evidence that VP instruction helped participants acquire the skills to complete the percent-word problems correctly. All five participants scored 0% correct in the pre-test. Post-test results showed two participants completed the post-test with 100% accuracy, one participant with 80% accuracy, and two participants with 0% accuracy. There is additional evidence that the two participants that scored 0% are skill acquiring the skill. Results for all five participants follows.

<Insert Table 3>

Jeanie. During baseline, Jeanie scored 0% for all five trials before entering intervention phase. Baseline was stable with no variability.

When the VP intervention was introduced, Jeanie scored 100% steps completed correctly. Jeanie quickly reached criterion with five consecutive data points at 100%. An additional four intervention probes were conducted before Jeanie took the post-test. During one intervention probe, Jeanie had a slight downward trend, but returned to 100% during the next probe session. The mean percentage of steps solved correctly during the intervention phase (including probes) was 98%.

Post-test results that showed whether or not students could solve percent-cost word problems a month after reaching criterion without the intervention were reported. Out of the five word problems on the post-test, Jeanie used all the steps necessary for four of the problems. For one of the problems, she completed 80% of the steps correctly, but got the final answer incorrect. She scored 80% on the post-test.

Elaine. Elaine scored 0% steps correct throughout all baseline phase. Data were stable with no variability. When Elaine transitioned to the intervention phase, she scored 100% steps correct in the first session. She scored 90% in her third intervention session, but scored 100% for all other trials. The mean percentage of steps solved correctly during intervention phase was 99%.

Elaine used all the steps necessary for completing all five of the word problems on the post-test. She scored 100% correct.

Clay. Clay scored 0% for all baseline sessions. He scored 80% steps performed correctly in his first intervention trial. After that, he reached 100% until he reached criterion. There was slight variability when he scored 90% in an intervention probe. Session 21 was removed from the data due to him hiding what he was doing on the calculator from the researcher. The researcher was not able to determine if he was performing the steps correctly without seeing the calculator. Session 22 did not count toward the five consecutive data points required for criterion because the researcher could not determine the percentage of steps completed correctly for the session that was removed. Clay's mean percentage of steps solved correctly during intervention phase was 97%.

Although Clay scored 0% correct on the post-test, his results of percent of steps solved correctly suggest that this skill is still being developed. For the first question, Clay scored 100% steps performed correctly. He did all the steps, but not in the right order. At one point, it appears he questioned himself and performed alternative calculations and came out with an incorrect answer. For question two, he scored 90%. For questions three through five, Clay scored 70%.

Krista. Krista had a steady baseline with no variability at 0% for all sessions. She started the intervention phase with 100% but then experienced some variability as she had scores of 70%, 80%, and 90% in between scores of 100%. Eventually, she did reach criterion. Her mean percentage of steps solved correctly during intervention was 94%.

A month after reaching criterion during intervention, Krista took the post-test. She used 80% of the steps correctly for all five questions. Because she missed two key steps, her final answers to the problems were incorrect. She scored 0% on the post-test. It appears Krista is still developing the target skill.

Tucker. Tucker had a steady baseline at 0% for all baseline sessions including probes. He had the most significant change from all baseline data at 0% to all intervention data at 100%. As with baseline, there was no variability or trend changes once Tucker started intervention. The mean percentage of steps solved correctly during intervention was 100%.

Tucker used all the steps correctly to complete the word problems on the post-test, scoring 100%.

Social Validity

Although much of single-case study must be objective and factual for replication and trustworthiness reasons, a subjective measure of social validity is also important to determine how well-received the intervention is by important stakeholders such as the participating students and teachers.

Social validity was assessed using a multiple-choice questionnaire given to the direct consumers, the participants involved with the research. The questionnaire asked questions that ensured an acceptance and understanding of the goal, method, and outcomes of the independent variable. It also obtained the participating student's thoughts, feelings, and perceptions about his or her target behavior achievement before and after the intervention, personal view on the effectiveness of the intervention, and likes and dislikes about VP. The participants' math teachers also answered a similar social validity questionnaire. The form was given in a multiple-choice format with space below each question to write notes or comments if the participant desired. The participants filled out the social validity questionnaire just after completing the post-test. The researcher read the questions aloud to the participant as he or she filled out the form. It took about ten minutes to complete.

Each participant's answers were analyzed and evaluated to establish the overall perceived effects of the intervention. Three out of the five participants reported that it was enjoyable to learn by watching a video on an iPad. One question assessed the participants' acceptability of an integral component of the VP intervention: having the video pause between steps. The question read, "Did you like having the video paused after each step to give you a chance to complete the step before going on?" Three participants reported, "Yes," with one also adding in the comments section, "The short pause for 'Now press the equals button,' was unnecessary." Two participants answered that pausing the video in between steps did not matter to them. One of these participants added in the comments section, "At first it was helpful." When asked if the participants would like to watch more videos teaching a skill in class, all five said they would prefer to have a combination of videos and teachers teaching them. Additional social validity results are shown in Table 4.

<Insert Table 4>

The three teachers that taught the participating students' core math instruction also completed a social validity questionnaire. Two teachers reported that it appeared the participants enjoyed the video-based intervention (the other teacher did not answer this question). All three teachers reported that if they were to use a video-based intervention for their students, they felt they would need access to custom-made, ready-to-go videos to help them succeed with implementation.

Discussion

The purpose of this research was to determine if a VP intervention for a mathematics skill via an iPad would help adolescent students with SLD acquire the steps to solving percent-cost word problems. Data from the study were evaluated to identify a functional relationship between the independent variable and dependent variable, percent of steps completed correctly. This functional relationship was observed because the dependent variable only changed when the VP intervention was introduced to the participating students.

The results of this study were similar to VP interventions that demonstrated success in previous studies (Banda, Dogoe, & Matuszny, 2001; Bellini & Akullian, 2007; Cannella-Malone et al., 2011; Johnson, Erika, Freeman, & Simmons, 2013; Kagohara, Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012; Kellems & Morningstar, 2012; Taber-Doughty et al., 2011). Although this research was one of the first VP studies on students with SLD, the functional relationship established in this study is also supportive of other VM research specific to students with SLD (Decker & Buggey, 2014; Hitchcock, Prater, & Dowrick, 2004; O'Brien & Wood, 2011). In addition, the results support the existing research on the positive effects an intervention delivered via iPad can have on student skill acquisition (Flores et al., 2012; Kagohara, Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012; Kagohara et al., 2013). The results also support existing research on positive results in student math skill acquisition (Burton, Anderson, Prater, & Dyches, 2013).

This research also aimed as answering the question of whether or not it helped the participants answer percent-cost word problems correctly. Although every participant did not score considerably higher in answering all the percent-word problems correctly on the post-test, the participants that scored 0% still did follow most of the steps in solving the word problems correctly. This evidence suggests that there is room for future study.

Results of the current study are useful in extending the current VM literature in various ways. This is the first study to evaluate the effects of a VP intervention delivered via iPad to adolescent students with SLD learning an academic skill linked to the Common Core State Standards. This research also adds to the existing VM literature on students with mild/moderate disabilities, and to VP literature, specifically.

Limitations

This study would have been strengthened if it had included a maintenance phase. Initially, the researchers planned to use the first question answered on the post-test as maintenance data. However, the structure of the post-test was different than what participants received in baseline and intervention, so the researchers decided to not include the data as maintenance. The difference was that during intervention, the participant was given one word problem on a single worksheet and in the post-test, the participant was given five word problems on a single worksheet. The findings from the post-test are still valuable and reported in the results. Reporting any post-test data was decided against because procedures for intervention and post-test were not identical. It would have been helpful to assess whether or not learning the steps to solving percent-cost word problems were retained over time.

Limitations existed within the word problems. Researchers only used prices that ended in .50 cents through .99 cents to make it easy for the students to round up. However, if the goal is to train students to use this skill in real-world application, it would seem beneficial to have prices that ranged from .00 cents through .99 cents.

Another limitation was the first author also taking the role of teacher and researcher. It appeared this could have affected how seriously some participants received the intervention. For example, during one of Clay's trials, he was joking around and covering his calculator, so the researcher could not see. Because of this, the researchers determined it would be best to remove the trial from the study. It may have been advantageous to the study to have a primary researcher who the students are unfamiliar with.

Suggestions for Future Research

Replication of this study would help to validate and strengthen the current research questions. In addition, this study could be used to answer other research questions such as inquiry about engagement/on-task behavior. This study could also be used to compare the effectiveness between a VM intervention or a VP intervention for adolescent students with SLD. Additional research is also needed on the effects VP has on other Common Core State Standard skills. It would be of high importance and usefulness to determine if the current study affects the use of this skill in real-world application. For example, after these methods are implemented, do students generalize the skills to purchase items of interest that are marked down a percentage off? Another recommendation is for researchers to implement a procedure of fading prompts for the VP intervention or combining VM with teacher led instruction. This suggestion is based on the results and comments from the social validity questionnaire.

Implications for Practice

This research shows that technology, specifically an iPad, can be used to differentiate instruction and implement intervention to improve academic performance of adolescent students with SLD. This disability is similar to others in that creative instructional interventions must often be used to help these individuals learn. Visual imagery is a validated method for teaching students with SLD (Decker & Buggey, 2014). This makes VM practices, including VP, useful instructional tools for many students with SLD.

Once teachers have the materials they need and have taught students how to access the VM intervention, students can independently participate and follow the directions with less teacher supervision or assistance. While students are using the iPad, teachers can then use time to work with other students in small groups or one-on-one.

A VM intervention is also useful in promoting independence in students and giving students the opportunity to be accountable for their own learning (Kellems & Morningstar, 2012). These are essential skills for students to obtain, especially adolescent students preparing for adulthood.

Conclusion

The field of education is in constant motion. It evolves and changes often due to many factors including government. The Common Core State Standards are being used by many states as a means for developing curriculum and projecting educational goals. Interventions such as video prompting used in the current study can be used to deliver instruction that allows students with specific learning disabilities to access the Common Core.

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TABLES AND FIGURES

Table 1

Student Selection Criteria Results

Student	Age	IQ Test	IQ Score	Broad Math Score	Math Skills Grade Level	Math Improvement Goal
Jeanie	16	WJIII	97	78	5.5	Yes
Elaine	16	WJIII	103	84	3.5	Yes
Clay	16	UNIT	87	81	4	Yes
Krista	17	CTONI	96	82*	6	Yes
Tucker	16	WPPSI	86	77	5.5	Yes

*Math Reasoning Score

Note. WJIII = Woodcock-Johnson III Tests of Cognitive Ability (Woodcock, McGrew, & Mather, 2001); UNIT = Universal Nonverbal Intelligence Test (Bracken & McCallum, 1998); CTONI = Comprehensive Test of Nonverbal Intelligence (Hammill, Pearson, & Wiederholt, 1997); WPPSI = Wechsler Preschool and Primary Scale of Intelligence (Wechsler, 2002). Broad Math Scores are from the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew, & Mather, 2001). Math Skills Grade levels are from the Quantile Framework (Scholastic Inc., 2012). Math Improvement Goal information was obtained from the student's most recent IEP.

Table 2

Task Analysis

Step	Task Analysis
1	Access calculator on mobile device
2	Type in rounded up original cost of item
3	Hit “multiply” button
4	Type in percentage in decimal form
5	Hit “equals” button
6	Clear the screen
7	Type in rounded up original cost of item
8	Subtract previous calculation from rounded up original cost
9	Hit “equals” button
10	Verbally tell the teacher the final sale price of the item

Table 3

Mean Percentage of Steps Completed Correctly

Participant	Baseline	Intervention
Jeanie	0%	98%
Elaine	0%	99%
Clay	0%	97%
Krista	0%	94%
Tucker	0%	100%

Table 4

Social Validity Results

Question	# of Students said "Yes"	# of Students said "No"	# of Students that had Another Answer
Did you have fun watching a video on an iPad?	3	1	1, Student circled both "Yes" and "No".
Did the video help you learn a new skill?	4	0	1, "I am not sure."
Was the skill something you will use later in life?	2	0	3, "I might use the skill, but I am not sure."
Did it help to break down the skill into segments?	3	0	2, "I am not sure."
Did you like having the video paused after each step?	3	0	2, "It didn't matter to me."
Did you like using the iPad?	2	1	2, "I don't know."
Would you have rather watched the videos on something different?	0	2	3, "It doesn't matter."
Would you like to watch more videos teaching a skill in class?	0	0	5, "I would like to use a combination of videos and teachers teaching me."

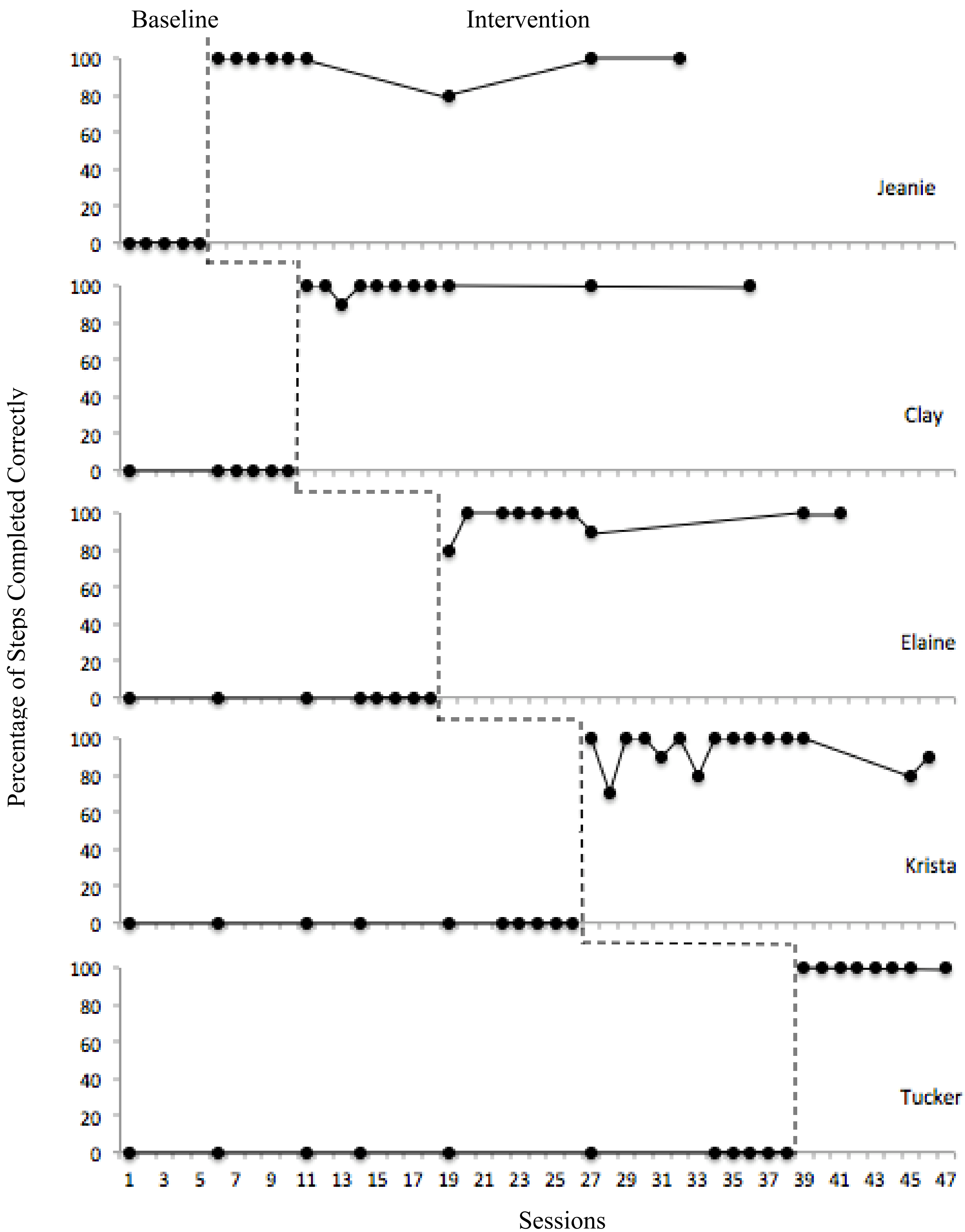

Figure 1. Graph of intervention results regarding video prompting intervention for five high school students with SLD learning a functional math skill.

APPENDIX A: Literature Review

A review of literature suggests that modeling is an effective, research-based scientific strategy for teaching individuals with disabilities. First made popular by Albert Bandura, modeling has proven to be an effective means of instruction in a wide variety of settings and with a diverse group of learners. In fact, modeling has become the foundation for many new, creative instructive delivery methods. Research has established video modeling (VM) to be an evidence-based practice.

Research for the review of literature that follows was obtained by using the EBSCOhost database as well as the ProQuest database. The search terms included video modeling, modeling, special education, autism, specific learning disabilities, learning disabilities, video self modeling, point of view modeling, transition, life skills, academic, behavior, social skills, and technology. The references section within the articles found were also used to identify additional articles that were studied for this review of literature.

Background

Evidence-based practice. Understanding what qualifies as an evidence-based practice, when referring to single subject research, is important for not only researchers, but also for parents, educators, psychologists/therapists, administrators, and students alike because these evidence-based practices are the backbone of teacher instruction. Horner et al. (2005) describes five standards that must exist for a practice to be qualified as evidence-based.

- The practice in question must be operationally defined. This means the practice must be detailed and described with adequate explanation so that individuals can not only understand the practice, but also implement and replicate the practice with fidelity.

- It must also be described in context. The practice needs to include statements on certain conditions is should be used in: the setting, participants that qualify to apply the practice, behaviors or dependent variables affected by the practice, etc.
- The practice in question must be implemented and documented in research to be done with strict observance to protocol. For example, if a practice calls for implementation to be done for at least 45 minutes every day, then in order to qualify as an evidence-based practice, it must be implemented at least 45 minutes every day. If the practice is not implemented 45 minutes every day or if a day is skipped, then that could jeopardize the validity of the practice.
- Through research, there must exist a functional relationship between the dependent variable (behavior) and independent variable (the practice in question).
- The practice is question must be researched at least five times and documented in peer-reviewed journals, the research must be done by at least three different experimenters in, the research must be conducted in at least three different geographical areas, and the five or more studies should have studied the effects of the practice on a total of at least 20 participants.

VM meets all the requirements of being an evidence-based practice. VM is being used to assist individuals with disabilities with the acquisition of different skills and behaviors including, but not limited to, academic, behavioral, social, and functional life skills. Even with the research that has been brought to light, there still remains additional research that is needed to determine the effectiveness of different VM techniques in teaching adolescent students with specific learning disabilities (SLD) various functional life skills.

From this review of literature, it is clear that VM is an extension from a much more broad and bigger idea. The roots of VM lie within a concept called social learning theory.

Social learning theory. Social learning theory describes learning as a cognitive process that occurs through observation or direct instruction combined with operant conditioning or reinforcement (Bandura & Walters, 1963). Albert Bandura's earliest work supported this principle. He and his first graduate student at Stanford University, Richard Walters, published *Adolescent Aggression* in 1959. This book consisted of an analysis on aggression and antisocial behavior in young adults through interviews with teenage boys. They determined that much of the adolescents' negative behavior resulted because of neglect and rejection. It appears that this would be validated by a later developed social learning theory idea of reciprocal determinism (Grusec, 1992).

After finishing their first book, Bandura and Walters were led to another aspect of social learning as they developed their second book, *Social Learning and Personality Development*. Their research suggests individuals learn through instruction, reinforcement, and the observation of others. Observational learning is now a large influential factor in the social learning theory (Grusec, 1992). In the words of Bandura and Walters (1963), "…imitation is an indispensable aspect of learning" (p. 3).

Bandura's contributions to social learning theory continued to expand. He discovered that the following aspects have great influence on how individuals learn: observational learning, self-regulation, self-efficacy, and reciprocal determinism. Observational learning occurs when (a) the observer is attentive to the modeled behavior, (b) the behavior is retained or remembered by the observer, (c) the observer organizes and compartmentalizes the behavior, and (d) the observer is motivated to carry out the behavior. Self-regulation is observer control over behavior, rather than an environment of extraneous variables having a control on behavior. Self-regulation is obtained only when an individual observes behavior from many different models in different situations and circumstances. Then, it is up to the observer to evaluate, synthesize, and digest the collected information and differentiate and determine when to perform such behavior. Related to self-regulation is self-efficacy. Bandura describes self-efficacy as a having a powerful effect on behavior because it extends to the observer's core beliefs about his own abilities and how much effort must be put in to reach a modeled behavior. Self-efficacy can either be strengthened or weakened by the individual's history of achievement. If the observer believes he can accomplish the behavior modeled by his peer, then he will not become distracted or emotionally preoccupied. Instead, he will be psychologically and physiologically motivated to reach the behavior. Mentioned earlier was the idea of reciprocal determinism. Bandura holds that there is interrelatedness between competencies (cognition), the individual (self-efficacy), the environment (situations, physical structure), and behavior. Each is influenced by one another and reciprocal determinism changes over time and across experience (Grusec, 1992). Bandura's contributions to social learning theory were significant. In fact, the research for this study (as well as many other VM studies) hinges on this theory and whether or not it holds true. If the pioneers of social learning theory are correct in their findings that environment or observation directly influences behavior, then modeling (including VM) can prove to be an effective tool for teaching any type of behavior.

Modeling. Modeling as a means by which individuals learn was first recognized because of Bandura's research. In the early 1960's, Bandura studied what behaviors would occur when (a) a young child was shown a video of a model that was aggressive with Bobo the blow-up doll and (b) then that child was left in a room to himself and given his own Bobo blow-up doll. In the video the model sat on the blow-up doll, punched it, hit it with a rubber mallet, tossed it in the air, and kicked it. The video also incorporated aggressive audio remarks such as, “Sock him in the nose,” “Pow,” and “Hit him down.” The children that watched the video often imitated the modeled behavior that they observed. Additionally, this study indicated that the children who viewed the video model were nearly twice as more aggressive towards the blow-up dolls than the children who did not see the aggressive video presentation (Bandura, Ross, & Ross, 1963).

Bandura and a countless number of his successors have studied, researched, and found support on the effects modeling has on behavior (Ayala & O’Connor, 2013; Bellini & Akullian, 2007; Cannella-Malone et al., 2011; Cihak, Smith, Cornett, & Coleman, 2012b; Decker & Buggey, 2014; Ganz, Earles-Vollrath, & Cook, 2011; Hammond, Whatley, Ayres, & Gast, 2010; Johnson, Blood, Freeman, & Simmons, 2013; Mason et al., 2013). To expand this idea, many people that desire to learn a new skill or acquire a new hobby often register for classes that will teach them to do so. For example, a prospective dancer will attend classes taught at a dance studio. While there, it is likely that his instructor will model what to do and then the student will attempt to mirror the actions. This method of observational learning is often more desired as opposed to other more independent teaching strategies like reading from a textbook. Learning through this method has also been generalized across different delivery mediums such as technology. Popular website, YouTube, was founded and launched in February 2005 (YouTube, n.d.). Since then, millions of viewers have had access to “How To” videos in which people model how to perform certain behaviors and tasks ranging from tying a tie, making origami, and making cake frosting to teaching a dog tricks, planting tomatoes, and learning American Sign Language.

Modeling is effective in many settings as an instructional tool to teach desired behaviors to all individuals including those with disabilities. Students with all types of disabilities have benefited positively from modeling techniques and applications. Modeling has converged with technology to expand the reach and influence it has on teaching students with disabilities with the use of VM procedures.

Video Modeling

"Video modeling is a technique that involves demonstration of desired behaviors through video representation of the behavior" (Bellini & Akullian, 2007). As an evidence-based practice, VM has shown positive effects for teaching students with disabilities a wide variety of skills (Johnson et al., 2013). With VM, a video of a desired task is shown in its entirety to a student. Then, after watching the whole sequence of behavior, the student is then expected to perform the target behavior from start to finish (Mason et al., 2013). There are different types of VM.

When a student uses VM with other as a model, the student watches a video of a model other than himself performing the desired behavior (Mason, Ganz, Parker, Burke, & Camargo, 2012).

Video Self-Modeling (VSM) is when a student watches a video of himself performing the desired behavior. For researchers to obtain such a video, the subject is recorded as he is prompted through the target behavior. After filming, the video is edited and put together to make it seem as if the student can perform the behavior without any prompts necessary (Santini, 2007).

Point-of-View Modeling (PVM) is when a student views a film depicting the desired behavior and what the performance would look like from the student's perspective. Typically, a model will have the video camera attached to his shoulders or forehead (near eye level). The final result allows the student to see where his hands should be and where his eyes should be focused as he tries to complete the target behavior (Tetreault & Lerman, 2010).

Video Prompting

It is also important to note differences in how the VM is implemented. There is a distinction between VM and video prompting (VP). In VM, a model is recorded performing a target behavior and then the video is shown from start to finish to the student. The student is then expected to execute the target behavior in its entirety. VP occurs when the student is shown separate clips of a model performing a target behavior piece by piece or one step at a time. Then, the student is given the opportunity to perform the task-analyzed behavior before the next step is presented (Cannella-Malone et al., 2011). A review of literature suggests VP may be more effective than VM in teaching skills to individuals with significant disabilities because it does not require the observer to remember a whole sequence of events from start to finish (Banda, Dogoe, & Matuszny, 2011).

Effectiveness of Video Modeling and Video Prompting

A review of literature shows that there is ample research available to support the positive effects VM and VP have on skill acquisition for individuals with disabilities. The following benefits are also generalized and apply to VP interventions because of the similarities between both practices. In this section, “VM” can also be replaced with “VP” when the perceived benefits are discussed. Bellini and Akullian (2007) performed a meta-analysis on 23 studies on VM involving school-aged participants with autism spectrum disorder (ASD). They observed the effects VM had on communication skills, life skills, and behavioral functioning. Overall, they concluded that VM interventions were effective and efficacious. As noted earlier, one of the key components to social learning theory is the level of attention the observer gives to the model, because the observer cannot replicate a behavior that he has not attended to. Bellini and Akullian support this idea and suggest that VM encourages the observer to place a high level of attention on a model because videos are visually stimulating to individuals with ASD. It appears that VM is more engaging for many students (especially visual learners) compared to other traditional methods of teaching. Along with this thought, the visually-based intervention is also helpful because it drastically reduces the amount of irrelevant stimuli in the environment because it is presumed the individual is giving his undivided attention to the model and the target behavior being performed (Tetreault & Lerman, 2010). Another way VM reduces unwanted distractions in the learning environment is through video editing.

Another benefit of VM that has been documented includes permitting students to be more self-confident and independent in their work because VM decreases reliance on prompting from the instructor (Ganz et al., 2011). Therefore, it can be safely assumed that VM can reduce the negative effects of the learned helplessness that educators, parents, and administrators constantly try to battle.

Bellini and Akullian (2007) also acknowledge the longevity of positive effects VM procedures have on students, specifically those with ASD. Their meta-analysis revealed the learned target behaviors from VM were maintained overtime and generalized across persons and settings. Similar outcomes were realized in other individual studies by researchers (Charlop, Dennis, Carpenter, & Greenberg, 2010; Johnson et al., 2013; Kellems & Morningstar, 2012; O'Brien & Wood, 2011; Taber-Doughty et al., 2011).

Educational Application

There have been many studies conducted on the effectiveness of VM. Many of these studies involve different types of VM that have been used in schools as an aide to teaching individuals with disabilities. Much of the research in this area has focused on students with ASD, serious (SED), intellectual disability (ID), or other significant disabilities. The bulk of the research shows VM as an effective instructional strategy at teaching a wide range of skills and behaviors such as (a) in-depth writing instruction (Delano, 2007), (b) increased on-task behavior and decreased disruptive behavior (Blood, Johnson, Ridenour, Simmons, & Crouch, 2011), (c) socially appropriate expression of feeling (Charlop et al., 2010), and (d) transition skills such as food-preparation (Johnson et al., 2013) and work skills (Allen, Wallace, Renes, Bowen, & Burke, 2010).

Academic. VM researchers have improved academic understanding in students with disabilities. Delano (2007) used VM, specifically VSM, to increase written language performance for adolescent students with high functioning autism. Students created a video of themselves modeling with audio how to write a persuasive essay using the TREE mnemonic (Topic sentence, Reason, Explanation, Ending). The video was edited and shown to the students before engaging in written expression intervention. The method used was a multiple baseline design across responses. The students received academic gains from VSM. Baseline observations show the students ranged from including zero to six functional essay elements in their writing. After the intervention was implemented, the students averaged from including 10-17. For all participants, the number of words written increased. The students ranged from 100, 52, and 17 words written in baseline to 384, 102, and 46 words written after VSM intervention, respectively.

Burton, Anderson, Prater, and Dyches (2007) used VSM to teach middle school-aged students with ASD and ID a functional math skill: estimating an amount of money it takes to purchase something and how much change to expect back from the purchase. The student first watched an edited video of himself performing the target behavior, completing a math problem. The student could pause, fast-forward, or rewind the video as often as he chose in order to complete the problem. A multiple baseline across participants design was used. Baseline results were low. The students ranged from zero percent to a high of 30 percent correct. Within the first session of VSM being introduced, each student immediately performed the target behavior of at least 90 percent correct. Each student reached 100 percent correct by the second session. The results of this study indicated a functional relation between the dependent and independent variables.

VM techniques have also been used to increase academic skills for at-risk students. Ayala and O'Connor (2013) used VSM to increase reading abilities, specifically areas of reading that deal with phonemic awareness such as blending, segmenting, and decoding words and reading sight words, for students in the first grade (about six to eight years of age). Each student was filmed as he or she participated in reading instruction in a private classroom with an adult tutor. The student would work on activities such as blending consonant, vowel, consonant (cvc) words similar to words like /c/ /a/ /t/. The tutor would direct the student to identify the sounds that made up the word. If the student needed assistance doing so, the student would be prompted until he did the activity correctly. Afterwards, the videos were edited and put together so that it showed the student performing the target behavior with accuracy. After the videos went through the editing process, the final product included five decodable words and five sight words. Each student watched a video of himself four times per week. After going receiving the intervention, they were expected to perform the reading skills they were just taught correctly. The method used was a single subject multiple baseline across participants. The students generally showed steady baseline results across the different domains. Out of nine students, five students showed an improving trend in decoding words within three sessions. Similarly, three students showed a clear increase within four to five sessions, and for only one student it took about eight sessions. The researchers determined that sight word skills increased through the VSM intervention for three of the students after only two sessions. For most of the other students it took three to four sessions and for two students it took six to nine sessions. In conclusion, all students that participated in the research design improved in decoding and sight word recognition reading abilities. In addition, most of the students maintained or even improved their highest score two weeks after the intervention was removed. This study established a functional relation between the independent variable (VSM) and dependent variable (decoding and sight words).

Behavior. Students with SED often have behavioral disorders. Many times these behaviors can include non-compliance and become may become extremely disruptive. VM has been used as a means to teach appropriate behavior. Blood et al. (2011) used VM with other as a model to teach an elementary-aged student with ED that had off-task and disruptive behavior issues. They recorded this student's peers performing target behaviors such as keeping eyes on the whiteboard, raising hand to ask a question, and quiet and listening when the teacher is talking. The student was given the video to watch five minutes before participating in his math group. The method employed in this study was a single-subject changing conditions design. Disruptive behavior decreased and correct classroom behavior increased once the VM intervention was introduced. The results of this study showed a student that performed a mean percentage of intervals on-task at 44% during baseline. After the intervention, on-task behavior went up to a mean percentage of intervals of 99%. Similar positive outcomes occurred for this same student in terms of disruptive behavior. His mean percentage of intervals of disruptive behavior was 40% in baseline. After the intervention, it went decreased to 0%.

Social. Charlop et al. (2010) studied the effects VM with other as model has on socially appropriate expressions for elementary-aged students with ASD. The objective was to teach the students how to use acceptable verbal comments (responses), intonation, and facial expressions. The VM researchers developed 3 different video scenarios for each student. The videos had models depicting the various target behaviors within each scenario. A multiple baseline design across participants was used. After the students received the VM intervention, all students reached criterion levels of performance for all areas within 3-4 times of watching the video. The students verbally responded to situations with proper expressive language with correct intonation and facial countenance.

Children with autism were taught various appropriate play skills using a PVM intervention in the research done by Sancho, Sidener, and Reeve (2010). The videos showed the play materials and two hands manipulating the materials. Examples from this study include a circus play set depicting a dog jumping through a hoop, a lion going into a pool, and an elephant drinking from a trough. Each scenario was paired with vocalizations that matched the action being modeled. In this study, the child was expected to manipulate the toys as the VM intervention depicted while the video was being shown. The method used was an adapted alternating treatments design with a multiple probe design across participants. In baseline, the children achieved the target behavior at zero percent for the number of play actions imitated. After the VM intervention, the each child eventually reached 100 percent. The VM procedures proved to be effective in teaching social play skills.

Transition. Transition areas encompass a vast spectrum of important life skills such as independent living such as hygiene, cleaning, and cooking; vocational; post-secondary education; and recreation and leisure. It is important for students with disabilities to learn about transition before graduating high or post-high school to foster a better quality of life. Because transition is so important, researchers and educators have employed VM techniques in and out of the classroom to facilitate the attainment of a variety of transition abilities.

Johnson et al. (2013) used a combination of VM with other as model and PVM with a VP delivery to teach high school students with ASD and ID food-preparation skills. The videos demonstrated how to prepare a smoothie, macaroni and cheese, and pizza. After the videos were loaded onto an iPod Touch, the students were expected to watch a video segment, perform the desired direction, and then move on to the next step in the sequence until the food item was properly prepared and ready to eat. A multiple-probe-across-behaviors research design was used in this study. After receiving the VM instruction, all students immediately increased in their acquisition of food preparation skills. After a few sessions of watching the videos, they were able to reach performance at 100% for all three tasks. Maintenance was assessed after all instructional sessions were concluded and the students continued to reach criterion performance at 100%.

Mechling, Ayres, Foster, and Bryant (2013) performed a study on the effects PVM and VM with other as model delivered as VP has on adolescent students with ASD. The goal was to evaluate the outcomes this intervention had in order to teach cooking skills. The students were shown a video of the model performing a step in a sequence of either making pancakes, instant mashed potatoes, or instant oatmeal. After each step, the student would be expected to mirror the model's actions before proceeding to the next step in the sequence. Students were also allowed to perform the step as the video was playing. To establish a functional relation between the independent variable, the VP intervention, and dependent variable, percentage of correctly completed cooking tasks, an adapted alternating treatments design was used. Each of the high school participants scored at or near zero percent during baseline. The moment the VP intervention was introduced, the student's showed a dramatic, positive increase in acquisition of target behavior. Three of the four students performed 100% of the steps correctly on the second session of the intervention. Another interesting discovery of this research is that the outcomes of VP were compared with models shown in commercial-made videos. The study shows that custom-made VP videos were more effective than commercial-made videos. Results in achieving the cooking skills for each student were consistently lower for every session when the commercial-made videos were used compared with the custom-made videos.

A study was done with four young men (ages ranging from 16 to 25) diagnosed with ASD. The researchers tested the effects VM had on teaching these individuals a specific vocational skill: wearing a WalkAround suit to entertain customers. A WalkAround suit is a blow up costume people put on that is used commonly by sports teams, school assemblies, and in-store and event advertising. The VM intervention for this purposed incorporated VM with other as model and PVM to teach the target behavior. The participants would watch the videos of appropriate costume behavior and then be expected to display such behavior in a retail store setting. The method used to compare effects of VM was a multiple baseline across participants design. After the VM intervention was introduced, the young men learned to interact with customers in a variety of ways such as shaking hands, waving, and manipulating the costume's eyes, ears, and tail. Baseline results showed a very low, close to zero, percentage of target behaviors. After the second session of the VM intervention, the target behavior increased to 35-40% for each participant. They all reached criterion performance. The researchers found "video modeling was an effective way to teach adolescents and young adults with ASDs to perform a vocational task in a social setting" (Allen et al., 2010, p. 344).

Sigafoos et al. (2007) used PVM delivered as VP as a means to teach adults with autism an important life skill, dish washing. All three participants were male and ranged between the ages of 27 and 33. The target behavior was task analyzed into ten different steps from plugging the drain to placing the dried dishes in the cupboard. Each step was filmed separately (with the exception of two of the steps that were combined). Verbal instructions that corresponded with the step were added to the video clips. A multiple baseline across participants design was used to show a functional relation with the VP intervention. After baseline data were collected, the researchers implemented the intervention. The subjects were shown a video clip of a step in the sequence of the task and then instructed to perform. The adults had 30 seconds to complete the step before being shown the next video. During baseline, the three adults completed 10% of the steps correctly, 20-30% correctly, and a stabilized 40% correctly. The adults reached criterion performance quickly once the VP intervention was introduced. All three maintained 90-100% correct.

Using VM with Other Interventions

VM researchers have also incorporated other educational strategies to determine effectiveness on skill acquisition for individuals with disabilities. Ganz et al. (2011) applaud VM for its flexible ability that allows it to be implemented with other instructional strategies. Some of these strategies VM has been paired with include self-monitoring interventions (Apple, Billingsley, & Schwartz, 2005; Blood et al., 2011), prompting (Johnson, Blood, Freeman, & Simmons, 2013; Taber-Doughty et al., 2011), and Social Stories™ (Cihak, Kildare, Smith, McMahon, & Quinn-Brown, 2012a). Review of the literature suggests positive results when VM is used in combination with other research-based methods.

Self-monitoring. With self-monitoring skills, students track their own behavior, better take control of their learning, and become proactive learners. Apple et al. (2005) used VM along with self-monitoring strategies to teach 4 to 5 year old students with ASD social skills. The target behavior was for students to independently give compliments to their peers. There were three different types of compliments depicted within the VM intervention: (1) words that imply a message of approval such as, “Neat,” (2) sentences involving the words “I like” such as, “I like your shirt,” and (3) sentences including, “You have/made…” including a positive-describing word such as, “You have a cool toy.” VM with other as model was used three times per week right before the participants engaged in free-play time. The study was performed using two groups of students. In one group the VM intervention was utilized without the use of self-management devices. A second group of similar students used the VM intervention and self-management devices. The self-management device was a wrist counter (one student used a checklist). The students were taught to track the number of compliments they made. If they made two compliments, they received a positive reinforcer such as bubble gum or a toy. The method used to show how effective the independent variable would be was a multiple baseline design across participants. The study showed positive gains in compliment giving when VM was used alone. Interestingly, the study showed even greater acquisition of the target behavior when VM was paired with self-monitoring strategies.

Prompting. Taber-Doughty et al. (2011) used VM and prompting to teach cooking skills to 6th Grade students with mild ID. VM with other as model and PVM were used to instruct the students on the steps of the recipe they were expected to complete. Along with using VM, a system of least prompts was incorporated. The prompt hierarchy used was as follows: independent student performance (no prompt), verbal prompt, gesture, modeling, partial physical prompt, and full physical prompt. To evaluate the VM intervention, an alternating treatment design was used. After receiving the VM intervention, all students made positive gains in their cooking skills. Depending on the student, baseline levels ranged from 42.8% to 58.5%. With VM, students ranged from 74.3% to 87%. When paired with VM and prompting, it appears that VM continues to be a successful tool for educators in teaching students with disabilities.

Social Stories™. Social Stories™ have been used often to encourage appropriate behavior from students with disabilities. Cihak et al. (2012a) coupled VM and Social Stories™ to increase task-engagement behavior for middle school-aged students with ASD. Negative behavior looked similar between some participants and different between others. Some of the off-task behaviors included putting head down, walking around the room, getting out of seat, using the computer without permission, and yelling. The target on-task behavior looks like students with a pencil on paper solving math problems or raising hand and asking either for help or for a ten second break. The students were filmed as they made Social Stories™ videos depicting the on-task behavior. The participants then watched the VSM intervention videos after the students were given a math worksheet. Evaluation of the Social Stories™ and VM intervention imply positive results. A functional relation was established, because off-task behaviors decreased and on-task engagement behaviors increased for all students that participated in the study. For example, one of the students showed baseline results for task engagement during the attention condition with a mean of 22%. His on-task behavior increased to 97% during the attention-seeking VM Social Story™ intervention. When the intervention was removed, task engagement lowered to 82%. When the intervention was re-introduced, target behavior increased to results that mirrored the observations when the VM Social Story™ was first introduced and used consistently.

Picture Exchange Communication Systems. VM has also been combined with Picture Exchange Communication Systems (PECS) in research done by Cihak et al. (2012b). PECS is a form of accessing communication that is typically used for individuals with non-verbal abilities. Typically, a student will choose a picture or set of pictures that describes the communication the student desires to have with another person. The student then hands the picture(s) to the person. These researchers used the aforementioned evidence-based strategies in order to increase communication skills in preschoolers with ASD and developmental delays. The dependent variable being observed was the percentage of independent communicative exchanges were made between the student and teacher using PECS. VM with other as model was used in this study. The student watched a video of a peer model from the class using a card with a picture on it in order to request a desired item from the instructor. Right after VM with other as model instruction, the students entered the PECS intervention phase of the research. It is during this part of the intervention the student was placed facing the instructor and in hands reach of the picture cards. The student was then expected to demonstrate what he saw during the intervention. An alternating treatments design was used to show a functional relation of effectiveness between VM and PECS interventions. Baseline for all students stayed at zero percent. Once the VM and PECS instruction was introduced, all students eventually reached 100 percent independent communicative exchanges for three trials.

Specific Learning Disabilities

Previous in this review of literature, much of the information has come from research of studies of VM on participants with severe disabilities. It is important to make note of the research available of studies of VM on participants with mild/moderate disabilities, specifically on students that have SLD.

SLD is defined by the Individuals with Disabilities Education Improvement Act of 2004 as a disorder where there occurs a lack of understanding or comprehension that manifests itself in the "imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations" (p. 12-13). SLD is common for individuals with brain injury, dyslexia, and even ADD or ADHD. This disability is similar to others in that creative instructional interventions must often be used to teach these individuals. Visual imagery as a means to learn is a great method to teaching students with SLD (Decker & Buggey, 2014). This makes VM a viable candidate as an educational practice. There is, unfortunately, a paucity of information on the effectiveness of VM on students with SLD because there is not a sufficient amount of research yet conducted. With the little research that does exist, studies do show positive outcomes of VM for this demographic.

Researchers Decker and Buggey (2014) conducted a VM study to evaluate the effect the intervention would have on reading fluency for elementary-aged students (ages 8 years 7 months to 12 years 1 month) with SLD. During intervention, the student would watch the video of himself or a peer with acceptable reading fluency. After viewing the video, the student would be expected to read a passage at the student's reading level. The dependent variable being observed was the number of words read correctly per minute. A multiple baseline design across participants was used to assess VM effects on acquisition of reading fluency. Baseline results showed steady trends for all participants. For example, one student's baseline was between 40 and 60 words read correctly per minute. After the reading fluency VM intervention was introduced, gains in words read correctly per minute were automatic. For the same student mentioned previously, intervention and maintenance data shows over 100 words read correctly per minute for all sessions. The researches also evaluated what VM procedures were more effective, VSM or VM with other as model. The outcomes showed that both were effective at teaching reading fluency to the participants. A functional relation can be inferred from the researchers' findings.

Another study done by Hitchcock, Prater, and Dowrick (2004) also used VM interventions to increase reading fluency for elementary-aged students with SLD. The first grade students were given a short story passage at their reading level. The students were timed for one minute and correct words per minute were recorded. An example of baseline results for one of the students with SLD ranged from around 20 correct words read per minute to 50 correct words read per minute with most sessions resulting in around 30 to 40 correct words read per minute. After baseline, the students were introduced to the VSM intervention combined with tutoring where the student watched an edited video of himself reading fluently. During intervention phases, all students made increases in the number of words read correctly in a minute. For the previous student mentioned, an increase to around 90 words read correct per minute was observed. This study is further documentation of a functional relation between the independent and dependent variables.

O'Brien and Wood (2011) studied the effects of VM on discussion group behavior for adolescents with SLD. The participants for this study were grade 12 students that ranged from ages 17 to 18. During baseline, students would be given a discussion question, directed to get into small discussion groups, discuss the article, and offer possible answers to the discussion question. During VM intervention, the students would be given a discussion question, watch a VM with other as model film of students displaying nonexample behaviors, and then participate in small group discussion. After the first brief discussion, the students would then watch a video of a model engaging in the target behavior: cooperative group discussion which included behaviors such as actively listening, contributing to the group discussion, and responding to other's comments or questions. The video model also depicted behaviors the researchers considered as "higher level content-oriented group discussion" like synthesis, inferential questions, and content application (p. 37). After watching the positive examples, the students would participate in another small group discussion. A multiple baseline across participants design was used in this study. All three students observed showed increases from baseline to intervention in cooperative group discussion and higher level content-oriented group discussion skills. All students reached 100% during the intervention and maintenance phases for cooperative group discussion. During intervention, all students reached at least around 80% for higher level discussion behaviors. A student even remarked that he felt the VM intervention helped him participate more than if he had not watched the videos. Another student mentioned that the VM procedures helped him to feel more "confident and comfortable" about participating in small group discussion (p. 36). Overall, VM proved to be an effective strategy to increase the targeted social behavior.

Technology

Within its name, "VM" suggests that without the technology component, its existence would cease. VM strategies are delivered to individuals through technology mediums. Common technologies that are used include iPods, iPads, iPhones, and similar. A comprehensive review of studies involving some of the aforementioned devices was conducted by Kagohara et al. (2013) on VM techniques used for individuals with disabilities. Fifteen studies involving participants that ranged from ages four to 27 years of age were analyzed. These studies involved academic, social (communication), and transition (employment and leisure) teaching programs. iPads have been used to improve use of spell checking for students (Kagohara, Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012) and to request desired item using a specific software program (Flores et al., 2012). iPods have been used in similar ways to iPads such as to request desired items using a specific software program (Kagohara et al., 2010; van der Meer et al., 2011). VM with iPods have also been used to give instruction on how to do household cleaning chores such as cleaning the bathroom, mopping the floor, and emptying the garbage (van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009), give fire safety trainings (Burke, Andersen, Bowen, Howard, & Allen, 2010), and even to give instruction on how to use an iPod for leisure purposes such as listening to music or looking at pictures (Hammond et al., 2010). All results from the evaluation Kagohara et al. did suggest both VM and VP procedures delivered via iPods, iPads, iPhones, and similar are effective and efficacious in teaching individuals with developmental disabilities a wide variety of skills, capabilities, and aptitudes. It has been reported that using hand held devices, such as iPods or similar, are seemingly effective and desirable because "they are portable, relatively inexpensive, and used frequently among individuals without disabilities, which potentially makes their use socially acceptable and reinforcing" (Blood et al., 2011, p. 301).

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APPENDIX B: Consent Form

Parent Permission for a Minor to Participate in Research
The Effects of Video Prompting on Students with Specific Learning Disability Learning a Functional Math Skill

Introduction
This research study is being conducted by Sean E. Edwards, B.S., a graduate student at Brigham Young University (BYU), and Ryan Kellems, Ph.D., a professor at BYU. The researchers are conducting a research study about the effects of an intervention designed to teach a functional academic skill to adolescent students with disabilities by viewing a video on an iPad. The researchers are inviting your child to take part in the research because he/she could benefit from the instruction.

Procedures
If you agree to let your child participate in this research study, the following will occur:

- Pre-Assessment: Your child will be evaluated and assessed to what degree they have mastered a mathematical skill of "rounding up" numbers. There will also be an assessment to determine iPad competency.
- Baseline: Your child will be asked to perform a task he or she may not have had practice with or been taught yet.
- Intervention: If selected to participate in the intervention phase, your child will watch a video of someone successfully performing the academic skill on an iPad. They will watch the video in steps. After each step, your child will be asked to perform what he or she saw on the video. The research will take place in the setting where similar academic tasks are usually performed. Observations will occur for a few weeks with two to three observations per week.
- Maintenance: To determine the longevity of effects of the intervention, a maintenance phase will be conducted. Observations will occur about 3 threes after the last intervention observation occurs. The maintenance phase will only consist of 2 to 3 sessions. This study will take an estimate of about 10 weeks to complete. The observations may be video taped for the researchers to review. The videos will only be used for purposes consented to on the video consent document.

Risk/Benefits
If you agree for your child to participate in this study, there may be some slight anxiety involved when a researcher observes your child. Additionally, your child may also feel discomfort or embarrassment about performing a task after having watched it on the iPad. Preparation on how to use the iPad should minimize the risks associated with the intervention. Your child will be told that if he or she does not want to participate in the study for any reason, he or she can let us know and the study with your child will be stopped.

Confidentiality
Any information that is obtained in connection with this study and can be identified with your child will remain confidential and disclosed only with your permission. Your child's identity will be kept confidential. Any write up or published material about the findings of the study will

use a pseudonym for your child. Your child's name will not be associated in any way with the information collected from the study. The researchers will not share information about your child unless required by law or you give permission. Electronic information will be stored on a password-protected computer and paper information will be stored in a locked office.

Compensation
There will be no compensation for participation in this project.

Questions
Please direct any further questions about the study to Sean at (801) 221-9720 or seane@provo.edu. You may also contact Ryan Kellems at (801) 422-6674 or rkellems@byu.edu. Questions about your child's rights as a study participant or to submit comment or complaints about the study should be directed to the IRB Administrator, Brigham Young University, A-285 ASB, Provo, UT 84602. Call (801) 422-1461 or send emails to irb@byu.edu. You have been given a copy of this consent form to keep.

Participation
Participation in this research study is voluntary. You are free to decline to have your child participate in this research study. You may withdraw you child's participation at any point without penalty. If you choose to allow your child to participate, please fill out the consent to participate form.

Sincerely,
Sean E. Edwards, Primary Researcher

I have read, understood, and received a copy of the above consent, and of my own free will and volition give consent for my child to participate in this study.

Child's Name: ____

Signature of Parent/Legal Guardian: ____________________________ Date: ______________

Signature of Researcher: ______________________________________ Date: ______________

APPENDIX C: Data Collection Form

Participant: ____

Date: ______________________________ Session: ________________________

Skill/Task: PERCENT-COST WORD PROBLEMS

Key: 1 - Step completed independently 0 – Step not completed independently

Task Analysis Steps:	Date			Date			Date			Date			Date		
	1/0 correct	# of prompts	# of views	1/0 correct	# of prompts	# of views	1/0 correct	# of prompts	# of views	1/0 correct	# of prompts	# of views	1/0 correct	# of prompts	# of views
1. Access calculator on mobile device															
2. Type in rounded up original cost of item															
3. Hit "multiply" button															
4. Type in percentage in decim form															
5. Hit "equals" button															
6. Clear the screen															
7. Type in rounded up original cost of item															
8. Subtract previous calculatio from rounded up original cost															
9. Hit "equals" button															
10. Verbally tell the teacher the final sale price of the item															
(B) Baseline / (I) Intervention															
Percentage; Totals															

Note. Adapted from Kellems, R. O. (2010) Using video modeling delivered through iPods to teach vocational tasks to young adults with autism spectrum disorders (ASD).