The Effect of Video Modeling on the Fraction Mastery of Seventh-Grade Students with Learning Disabilities

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This single-case study investigates the effectiveness of video modeling for teaching the Look, Ask, Pick (LAP) strategy to three seventh-grade students with learning disabilities. The participants watched video segments explaining the technique to solve fraction problems. Results from the intervention revealed substantial performance improvements in all students. Descriptive statistics and effect size measures, used to assess the treatment's efficacy, indicated that two students exhibited immediate, progressive, and overall treatment effects, while the third student showed progressive and overall effects without an immediate impact. The effect size measures confirmed strong and statistically significant improvements for all participants. Findings highlight video modeling as an effective instructional approach for students with learning disabilities. Additionally, participant feedback reflected high enjoyment and a perceived enhancement in multiplication skills, suggesting strong social validity for the intervention.

Keywords: **video modeling, learning disabilities, single-case study, Look Ask Pick strategy, fractions, intervention effectiveness**

Introduction

The Critical Role of Fraction Proficiency

Mathematics plays a vital role in education, professional development, and everyday life. Among the various concepts in this context, proficiency in working with fractions is particularly important, as it forms the foundation for later success in more advanced areas of mathematics (Ennis & Losinski, 2019; Grünke & Barwasser, 2024; Morris et al., 2022; Schadl & Ufer, 2023; Siegler & Lortie-Forgues, 2017). Research has consistently revealed a strong connection between students' understanding of fractions and their overall mathemati-

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cal performance. Siegler et al. (2013) demonstrated a significant correlation between fraction knowledge and general mathematics achievement. Torbeyns et al. (2015) obtained similar results in an international study involving sixth- and eighth-grade students. Mastering fractions is essential not only for excelling in areas such as data analysis, probability, measurement, geometry, ratios, and algebra but also for developing broader mathematical literacy (Chval et al., 2013).

Beyond academic success, the ability to work with fractions is critical for everyday tasks such as adjusting recipes, taking measurements, and managing finances (Grünke & Barwasser, 2024; Mazzocco & Devlin, 2008; Obersteiner et al., 2019; Siegler & Lortie-Forgues, 2017). Moreover, numerous middle-income professions, such as nursing, carpentry, and auto mechanics, that do not demand advanced mathematical skills require knowledge of fractional mathematics (Tian & Siegler, 2017). In 2016, a survey of over 2,300 workers revealed that 68% of the participants reported using fractions in their daily tasks (Handel, 2016). Considering the significant impact of fraction competence on success in future careers, it is concerning that many students struggle with this foundational skill (Tian & Siegler, 2017).

Challenges in Teaching Fractions to Students With Learning Disabilities

Although elementary school instruction focuses on basic fraction operations, a significant proportion of children, particularly those with identified learning difficulties, continue to struggle and require additional support when transitioning to secondary school (Siegler et al., 2012; Tian & Siegler, 2017). This is because acquiring fractional competence is challenging and necessitates a secure understanding of the core concepts of fractional knowledge (Brown & Quinn, 2007; Grünke et al., 2023; Siegler et al., 2020).

Recent findings from the National Assessment of Educational Progress (NAEP) indicated that in 2022, only 47% of fourth-grade students with disabilities (especially nonverbal learning disabilities) reached the basic performance level or higher in mathematics compared with 80% of fourth-grade students without disabilities (U.S. Department of Education, 2022). Notably, low-achieving students make minimal progress between the sixth and eighth grades compared with their higher-achieving peers (Berch, 2017). The NAEP 2022 results further indicated that only 28% of eighth-grade students with disabilities achieved the basic level or higher in mathematics compared with 67% of those without disabilities. These outcomes were significantly lower than those in the 2019 NAEP administration, which found that less than 10% of eighth graders with disabilities met or exceeded the performance standards (NAEP, 2019).

Hence, students with disabilities risk failing to acquire the mathematical skills necessary for pre- and postsecondary education. These deficits are concerning because mastering fractions is a crucial prerequisite for meaningful mathematics learning in secondary education and is essential for general functioning in daily life (Grünke et al., 2023).

Effective Intervention Strategies for Fraction Mastery

Research has consistently identified effective strategies to help struggling learners develop strong fraction skills. These approaches have improved both conceptual understanding and procedural fluency in working with fractions (e.g., Hord et al., 2020; Hunt et al., 2022, 2023; Newton et al., 2022).

Misquitta (2011) conducted a systematic review of instructional practices for teaching fractions to struggling learners by analyzing 10 empirical studies. The author found three interventions to be particularly effective in enhancing fraction skills: graduated sequence, strategy instruction, and direct instruction. The findings highlight the critical role of systematically guiding students through fraction tasks with clear explanations and structured practice.

Ennis and Losinski's (2019) review of fractional mathematics interventions highlighted the effectiveness of video modeling. Their analysis of 21 studies demonstrated that explicit instructions met the highest quality indicators, with video modeling demonstrating significant potential to streamline and enhance the delivery of these methods. Since this mode of instruction allows clear demonstrations of fraction concepts and step-by-step strategies, it provides students with repeated exposure to critical skills at their own pace. This approach not only reinforces systematic instruction techniques but also offers a cost-effective and scalable solution for reaching a larger population of struggling learners.

The Look, Ask, Pick (LAP) Strategy: A Promising Approach for Fraction Mastery

The Look, Ask, Pick (LAP) strategy, introduced by Test and Ellis (2005), is a particularly effective approach to supporting learners experiencing significant difficulties in mastering fractions. By incorporating key elements from previous research, this strategy offers a structured method of helping students overcome mathematical challenges. This mnemonic tool was specifically designed to help students master fraction addition and subtraction, whether with like or unlike denominators, providing a clear and systematic framework that could be applied from elementary through high school.

The LAP strategy categorizes fractions into three types based on the relationship between their denominators. As indicated in Figure 1, each task has corresponding sequences of actions for students to follow. By offering a clear and organized method, the LAP strategy helps students build a solid understanding of fraction operations. Learners are expected to not only enhance their skills but also to gain a deeper comprehension of the underlying concepts (Grünke & Barwasser, 2024).

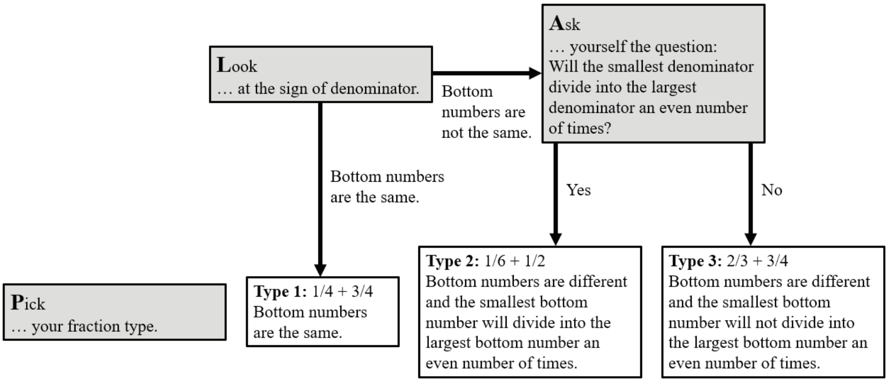

Figure 1. **LAP Strategy**

Multiple studies have explored the LAP strategy's efficacy in teaching fraction skills to students experiencing difficulties in this area. Test and Ellis (2005) investigated its impact on six eighth graders, three with mild intellectual disabilities and three with mathematics learning disabilities, and found that five of the six learners mastered the strategy after using the intervention. Using a concurrent multiple-baseline design, Everett et al. (2014) similarly observed improvements in three 11-year-old sixth-grade students with fraction skill deficits, noting consistent gains in both the percentage of problems solved correctly and correct digits per minute during the LAP intervention.

Grünke et al. (2023) also employed a multiple-baseline research design including four struggling sixth graders, all of whom showed significant progress after using the LAP strategy, rating it as highly beneficial. By the end of the LAP intervention, the students could correctly solve nearly all the fraction problems, despite initial challenges. Moreover, Grünke et al. (2024) implemented the LAP strategy in a time-lagged manner with four struggling sixth graders, revealing substantial improvements in their fraction performance, further underscoring the strategy's effectiveness. The students expressed significant appreciation for the strategy, emphasizing its importance.

Grünke and Barwasser (2024) also assessed the LAP strategy with four sixth graders with severe mathematics difficulties. Initially, none of the participants could solve any of the problems. However, their scores improved once the intervention began. Two weeks post-intervention, however, three of the four students could not maintain their performance levels. Nevertheless, the intervention's initial effectiveness suggests that a brief refresher session could restore high performance levels.

Implementing LAP via Video Modeling: Addressing Resource Constraints

Even highly effective strategies such as LAP are of limited value if they cannot be implemented in everyday school practice. The research discussed in the previous section exclusively comprised single-case studies where participants were taught the strategies in a one-to-one setting. However, this teacher-student ratio is typically unrealistic in real-world classrooms. Therefore, research methods that allow a broader application of effective strategies are needed.

As previously noted, video modeling offers a promising solution to this problem. Defined as "the demonstration of behavior that is not live but is presented via video to change existing behaviors or teach new ones" (Sancho et al., 2010, p. 421), it overcomes many of the limitations of traditional one-to-one instruction. This approach provides a scalable and versatile tool, allowing for the dissemination of proven techniques such as the LAP strategy to a wider audience. Furthermore, by delivering structured demonstrations of fraction tasks, video modeling ensures that students receive consistent, high-quality instruction, even in larger classroom settings. Finally, this evidence-based strategy offers flexibility since students can revisit the material at their own pace, making it practical to implement in everyday school environments (Bellini & Heck, 2021).

Considerable research has been conducted on the effectiveness of video modeling in teaching basic mathematical skills, such as fraction arithmetic. In a systematic review, Boon et al. (2020) summarized the findings of four studies exploring the potential of video modeling in teaching mathematical competencies to students facing academic challenges, including individuals with learning disabilities. The results consistently demonstrated the effectiveness of video modeling interventions in significantly improving students' mathematical problem-solving skills.

Furthermore, research has shown that video modeling enhances learners' independence and accuracy in solving mathematical problems. Students who engaged in video modeling interventions typically required less direct instruction and demonstrated a higher degree of autonomy in applying the steps necessary to solve problems.

When taught using video modeling, the LAP strategy demonstrates significant potential as a highly effective method of teaching basic fraction skills. It can be seamlessly integrated into everyday classroom practice and does not rely on extensive personal resources. Therefore, video modeling can offer a sustainable and scalable solution for enhancing mathematical competencies among students with learning disabilities.

The Current Study

While previous studies have demonstrated the effectiveness of video modeling and the LAP strategy independently, this research uniquely integrates both methods into a single intervention to teach basic fraction skills to sixth-graders with learning disabilities. This innovative approach is crucial for advancing instructional practices for students with severe academic challenges. Thus it addresses a critical gap in the literature. Since the focus is on weak learners, the study centers on simple tasks: adding fractions without a common denominator, with the numerator and denominator no greater than 10, and with the larger denominator divisible by the smaller one. The primary objective is to examine the effects of a video modeling intervention on participants' ability to solve these fraction problems. A secondary aim is to evaluate the perceived social validity of the intervention among the learners.

Method

Setting and Participants

We conducted the study at a special education school supporting students with severe learning difficulties, located in a small town near a major metropolitan area in Germany. The school caters to children in grades 4 to 10 and emphasizes both academic achievement and emotional and social development. We examined a group of 15 seventh-grade students—seven girls and eight boys—14 of whom were identified as having significant learning disabilities.

We employed a multi-stage, criteria-based process to identify participants. First, the class teacher preselected students who, in their assessment, exhibited significant difficulties with adding fractions with different denominators. Since mastering basic addition is a prerequisite for working with fractions, we gave the students the standardized Heidelberg Arithmetic Test (HRT 1–4) and evaluated their performance against the norm for fourth graders. The test results allowed us to assess whether their addition skills were at least at the level expected of students at the end of their elementary education, a benchmark that is far from guaranteed in seventh graders with learning disabilities. We selected only those who scored at or above the 50^{th} percentile for the intervention.

Initially, six students met the eligibility criteria and expressed interest in participating in the study. We obtained informed consent from all the participants. However, due to illness-related absences occurring on three or more occasions, we included the data for only three students in the final analysis: Anna, Beatriz, and Cédric (names changed to ensure anonymity). The three children had spent all eight years of their schooling at the institution, had been in the same class since the fourth or fifth grade, and were raised in stable family environments. Table 1 provides the participants' demographic information (we obtained the intelligence quotient from the school records).

Anna

Anna experienced severe health challenges, including asthma and idiopathic fainting spells. Born prematurely at 34 weeks, Anna spent the initial five weeks following birth in intensive care. Early indications of concentration and perception disorders were observed during kindergarten. Anna was referred for special education support in elementary school due to significant learning difficulties and was later diagnosed with emotional and social development issues, characterized by heightened sensitivity and considerable uncertainty in unfamiliar situations.

Beatriz

Beatriz was diagnosed with both learning disabilities and emotional and social development issues. Beatriz also presented with a notable speech disorder, including stuttering, which was exacerbated under emotional stress. Beatriz had received speech therapy since preschool, and a preliminary diagnosis of Asperger's syndrome was revised in 2020.

Cédric

Cédric displayed learning difficulties and stuttering but otherwise exhibited typical early childhood development, according to parental reports. Cédric had been enrolled at the special education school since the fourth grade and was receiving speech therapy.

Table 1. ***Demographic Characteristics of Participants***

Participant	Gender	Age	IQ	Percentile HRT 1-4	Ethnicity
Anna	female	13	75	54	German
Beatriz	female	13	73	62	German
Cédric	male	13	70	52	German

Experimental Design and Measurement

Two master's students specializing in special needs education conducted the study with the children in a quiet corner of the classroom. Both of them had extensive experience in support roles within schools, assisting certified teachers while completing their graduate studies. Their responsibilities included delivering the treatment and collecting and analyzing the data. They alternately conducted the intervention.

Initially, we designed worksheets containing 10 fraction addition problems according to the following criteria:

1. No common denominators,
2. Numerators and denominators no greater than 10, and
3. The larger denominator divisible by the smaller one.

This set of tasks comprised 15 separate worksheets (one for each probe), which the master's students randomly assigned to the children. The dependent variable was the number of correctly solved fraction problems. Each participant was allocated three minutes to complete a worksheet; the same worksheet was used only once. The master's students recorded the correct solutions for each child at every measurement point. The master's students independently verified each other's recorded scores afterward. The interrater reliability determined in this manner was 100%.

We employed a multiple-baseline design (AB) to evaluate the intervention's effectiveness. This design allows for observing behavioral changes, attributing them to the treatment, and assessing their statistical and practical significance (Hawkins et al., 2007). Thus, it evaluates the impact of using video modeling to teach the LAP strategy to individual students to establish a causal link between the treatment and the observed changes (Horner & Odom, 2014).

The experiment design included fifteen daily probes covering the baseline and intervention phases. The treatment was initiated randomly, with students starting after the third, fourth, or fifth baseline probe. Anna began the intervention after the third probe (with 12 video modeling lessons), Beatriz after the fourth (with 11 video modeling lessons), and Cédric after the fifth (with 10 video modeling lessons). This staggered start aimed to minimize risks to internal validity (Morley, 2017). Initially, the children were paired for the intervention. However, of the original six participants, one from each pair missed the intervention so frequently that we could not use their data (see above).

Procedures

The baseline and intervention phases took place over three weeks, with 15 measurement points in total (one measurement taken daily from Monday to Friday). Each morning, one of the master's students conducted the sessions for 20 minutes, plus three minutes for performance assessment, for each pair. A predetermined order for attending to the teams was established and remained consistent throughout the sessions.

During the baseline phase, one of the master's students first engaged the participants in a simple card game (20 minutes) before presenting them with a randomly selected worksheet containing 10 fraction problems. The participants were not encouraged or assisted while they attempted to complete the tasks. Following the completion of each session, the master's students recorded the number of correctly solved problems.

During the intervention phase, the sessions lasted the same amount of time as in the baseline phase (20 minutes). The participants began each session by reviewing the previous day's worksheet. The master's students highlighted errors or issues and explained the correct method for solving the problems. Ten instructional videos, each 90 to 120 seconds long, were used to teach the strategy for adding fractions with unlike denominators. These videos featured simple explanations, with sentences consisting of no more than four to six words, and demonstrated only one example problem. The videos did not feature live-action films with a person modeling the procedure but used animated characters instead. Everything was created using a purposely designed app (Voki). We consistently applied the LAP strategy using the following steps:

1. Check the operation sign and the denominators.
2. Ask yourself if the smaller denominator divides evenly into the larger denominator.
3. Choose the type of fraction:
   A. The denominators are the same.
   B. The denominators are different, and the larger denominator is divisible by the smaller denominator.
   C. The denominators are different, and the larger denominator is divisible by the smaller denominator.

For Type B, follow these six steps:

1. Draw a box around the smaller denominator.
2. Determine how many times the smaller denominator fits into the larger denominator.
3. Write this number next to the number in the box and next to the numerator above the box.
4. Draw a fraction line next to your fraction and perform the following tasks:
   A. Multiply the number from Step 3 by the numerator and write the result as the new numerator next to it.
   B. Multiply the number from Step 3 by the denominator and write the result as the new denominator next to it.
5. Cross out the fraction that has the denominator with the number in the box.
6. Add the numerators and write your answer.

The master's students introduced this solution scheme to the students during the first intervention session. (In German, the initial letters of the individual steps form an acronym; however, this does not directly translate into English).

During the first intervention session, the participants watched a short and simple video with pauses at each strategy point to ensure that they understood the steps. This procedure was repeated in a second instructional video and orally, explaining the written version of the strategy to help the students internalize the steps. A sheet displaying the individual steps was prominently displayed during each session for the children to refer to. Subsequently, similar to the baseline phase, the master's students presented the children with worksheets comprising 10 problems to solve and recorded the number of correct answers. The participants were reminded that they could successfully solve the problems using this method at the beginning, during each step, and at the end of the intervention sessions.

In the second session, following feedback on the previous day's worksheets, the children repeated the steps using the sheet outlining the strategy. Subsequently, one of the master's students and two participants alternately named the steps, emphasizing each with a rhythmic tapping noise, to consolidate the procedure. The order was clockwise, with an emphasis on a quick, fluid sequence. The master's students then removed the sheet and presented a third instructional video that they paused at each step so that the students could perform the tasks independently. At the end of the session, the students completed another worksheet.

In the third session, the children received feedback on their performance and repeated the steps. When the students performed the steps confidently, the rhythmic pacing exercise was omitted; otherwise, it was repeated. After watching another video with appropriate pauses, the children completed the worksheet as before. This procedural sequence was maintained in all further sessions. At the end of the intervention period, the children watched a general instructional video containing no specific tasks. Generally, the children were encouraged to correct their errors.

The participants received smiley stickers for correctly solved tasks, which they could exchange for rewards at the end of the intervention. Following the treatment, the students were briefly interviewed to assess the intervention's social validity.

Procedural Fidelity

The master's students administering the intervention received thorough training via three video sessions, each lasting 45 minutes. They were also equipped with a comprehensive script to guide them. The first author oversaw the production of the video clips to ensure compliance with the specified requirements and received constant communication from the master's students throughout the intervention period.

Furthermore, a checklist (available upon request) delineating all the essential components and procedures for the intervention was developed to ensure adherence to the methodology. The master's students utilized this inventory during each session to guarantee uniformity and compliance with the established protocol. An observer monitored 20% of the sessions to assess procedural fidelity. According to Horner et al. (2005), observing and documenting treatment fidelity in at least 20% of the sessions is sufficient to affirm the intervention's reliability and validity. Three of the 15 sessions were observed per team to ensure that this standard was met. The units under observation in both the baseline and intervention phases were randomly predetermined. The observer discreetly monitored the sessions, focusing on compliance with the preset standards. Procedure fidelity was consistently maintained at 100%.

Social Validity

Immediately following the intervention's conclusion, the master's students briefly interviewed the participants to obtain feedback on several key aspects of the treatment through the following questions: “Did you enjoy the videos?”, “Did it enhance your ability to calculate fractions?”, “Do you feel your mathematical skills have improved?”, “Has your attitude toward mathematics changed for the better?”, “Would you be interested in continuing with the intervention?”, “Would you recommend this training to other children?”. The master’s students documented the responses succinctly.

Results

Figure 2 presents the number of fraction problems correctly solved by the three participants across all the study conditions.

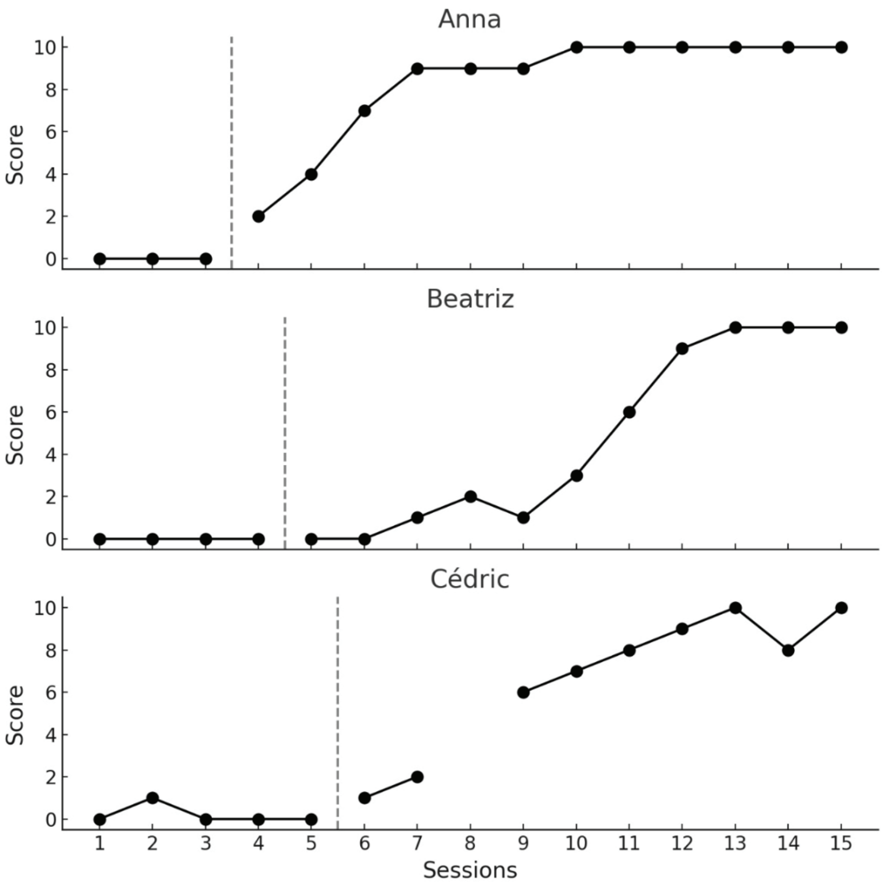

Figure 2. **Fraction Problems Solved for Each Participant in Each Treatment Condition**

A significant, gradual improvement in all the students' performances was observed during the video modeling intervention. Table 2 gives the means, standard deviations, and ranges for each child at each phase of the study. As illustrated, the three students initially gave virtually no correct answers, indicating that the initial competency level of the children was extremely low. Cédric was the only participant to correctly solve a single task during the baseline phase. However, we observed a notable average increase in performance during the intervention phase.

Table 2. ***Descriptive Statistics for Participants***

	Anna	Beatriz	Cédric
M Baseline	0.00	0.00	0.20
SD Baseline	0.00	0.00	0.42
Range Baseline	0-0	0-0	0-1
M Intervention	8.33	4.82	6.78
SD Intervention	2.50	3.96	3.04
Range Intervention	2-10	0-10	1-10

We utilized the Visual Aid Implying an Objective Rule (VAIOR; Manolov & Vannest, 2019) to ensure that the visual analysis of the data trajectories presented in Figure 2 was as objective as possible. This tool is designed to assess changes in trend and level between two adjacent phases, providing researchers with dichotomous decisions concerning the absence or presence of immediate, progressive, and overall effects. According to the VAIOR benchmarks, an immediate effect is present if the first three scores of the intervention phase are above the median of absolute deviations (MAD) from the predicted baseline values. If the final three values during treatment fall above the MAD, we can assume a progressive effect. An overall effect exists if fewer than 40% of the treatment scores are below the MAD.

In addition, we included two effect-size measures commonly used in single-case studies: Nonoverlap of All Pairs (NAP; Parker & Vannest, 2009) and Improvement Rate Difference (IRD; Parker et al., 2009). These overlap indices are particularly suitable for analyzing data because they capture gradual rather than abrupt performance improvements, effectively reflecting incremental progress over time and providing a nuanced understanding of the effects of the intervention. We calculated both indices using the tools available at https://singlecaseresearch.org/.

A detailed examination of the data for each participant revealed the following findings (see Table 3). Anna exhibited an immediate improvement from the baseline (no questions correctly answered). At the beginning of the intervention, Anna solved two fraction problems after the first video modeling session. Subsequently, Anna's competence exhibited a steep upward trend with no performance worse than on the previous day. After the seventh training session, Anna achieved the maximum score of 10 and maintained this level for the remainder of the B phase. Therefore, using VAIOR revealed immediate, progressive, and overall treatment effects. The NAP and IRD scores reached their maximum values (NAP = 100, $Z = 2.60$, $p < .01$; IRD = 1.00), indicating a perfect non-overlap and a 100% improvement rate. This result indicates that every measurement in the intervention phase had improved upon those in the baseline phase, demonstrating a flawless and highly significant treatment effect.

Beatriz experienced several initial difficulties, failing to correctly answer any questions after the first and second intervention sessions. Nevertheless, Beatriz solved one problem correctly following the third session, and two after the fourth session. However, by the end of the fifth session, Beatriz's performance had decreased to one correct answer. Subsequently, Beatriz's competence significantly improved, reaching the maximum score of 10 in the final three measurements. Although we detected progressive and overall treatment effects, we observed no immediate effect, which was expected given the lack of impact in the first two sessions. Nevertheless, a NAP score of 91 with a *p*-value of .019 ($Z = 2.35$) demonstrates that the results are statistically significant. Furthermore, an IRD score of 0.82 indicates an 82% improvement in the success rate, reflecting a strong intervention effect.

Although Cédric answered one question correctly during the baseline phase, his overall performance level was very low. After the first and second sessions, Cédric correctly solved one then two problems, respectively. Cédric was absent due to illness following these sessions. However, Cédric correctly solved six problems in the next session. Subsequently, Cédric's performance increased by one additional correct answer each day culminating in the maximum score. On the penultimate day of the intervention, Cédric solved eight problems correctly but finished the B phase with a high score of 10. According to VAIOR, Cédric exhibited immediate, progressive, and overall treatment effects. A NAP score of 99, just below the maximum value ($Z = 2.93$, $p = .003$), indicates a highly significant improvement. An IRD score of 0.89 shows an 89% increase in the success rate, reflecting a strong intervention effect.

Table 3. Treatment Effects for Participants

	Anna	Beatriz	Cédric
Immediate Treatment Effect	Yes	No	Yes
Progressive Treatment Effect	Yes	Yes	Yes
Overall Treatment Effect	Yes	Yes	Yes
NAP	100	91	99
IRD	1.00	0.82	0.89

The interview data revealed that all the participants (100%) responded positively to each question, indicating universal approval of the intervention. This unanimous feedback underscores the treatment's perceived effectiveness and appeal among the students. The consistently favorable responses suggest a strong endorsement for the intervention based on its impact on the children's mathematical skills and attitudes.

Discussion

Main Findings

In this study, we assessed the effectiveness of a video modeling intervention designed to teach the LAP strategy to enhance students' ability to solve simple fraction problems. Overall, all three participants exhibited a notable improvement in their performance following the intervention. The tasks involved adding fractions without a common denominator, with numerators and denominators not exceeding 10, and with the larger denominator divisible by the smaller one. Anna showed immediate progress, quickly reaching the maximum score, and maintaining it throughout the intervention. Despite initial difficulties, Beatriz also demonstrated significant progress and achieved the maximum score by the final sessions. Cédric's proficiency improved steadily, reaching the highest score after an initially weaker performance.

The results of the VAIOR, NAP, and IRD analyses confirmed immediate, progressive, and sustained treatment effects for Anna and Cédric, while Beatriz showed progressive and overall improvements, underscoring the intervention's effectiveness. These results align with previous research findings revealing the benefits of teaching the LAP technique using modeling, suggesting that this combination can lead to substantial advances in academic performance. Therefore, our study confirms that watching recordings of someone performing a target activity on a digital device, in this case, demonstrating the steps of a simple mathematics strategy, is a powerful tool for improving learning outcomes in seventh graders with learning disabilities.

Moreover, the study participants expressed high levels of satisfaction with the intervention, as reflected in their positive responses to a social validity questionnaire. Their feedback highlighted their appreciation for the approach, which they found to be both enjoyable and effective.

Study Limitations

Despite these promising findings, the study has several limitations that should be considered when interpreting the results. First, since this is a single-case study with only three students, no generalizable conclusions about the effectiveness of the approach can be drawn. This limitation is inherent in the research design. The widely accepted What Works Clearinghouse Standards (Hitchcock, 2015) emphasize the 5-3-20 rule: five single-case studies conducted by at least three independent research teams in different locations, with at least 20 participants are required to make generalizable claims about an intervention. Therefore, since our study is the first to combine teaching the LAP technique using video modeling, further replicated experiments are necessary to obtain more valid conclusions.

Another limitation pertains to the minimum number of baseline sessions, which in this case was three. The literature typically recommends at least five data points per phase (e.g., Tate et al., 2016). However, this approach must be balanced with ethical considerations. As noted in the widely accepted single-case intervention research standards provided by Kratochwill et al. (2013), it is crucial to weigh design criteria against ethical concerns. While five baseline points would be desirable, when examining academic performance data, longer baselines could repeatedly expose students to tasks they struggle with, which could be stressful for participants as they are continually reminded of their shortcomings. This concern is irrelevant when collecting observational data, such as on-task behavior. However, in cases that involve academic performance data, as in this study, three baseline measurements are considered sufficient according to the aforementioned standards.

Furthermore, due to the upcoming school holidays, we were unable to collect maintenance data. Consequently, we cannot make claims about the long-term sustainability of the observed effects. Although similar studies on mathematics teaching strategies suggest ongoing benefits (Bone et al., 2021; Faggella-Luby et al., 2019; Lee et al., 2020), whether they hold true for the LAP technique taught via video modeling remains uncertain. Therefore, further research on the long-term effects of this teaching method is needed.

In addition, the method employed to assess social validity could limit the robustness of the conclusions. Since master's-level students who were closely involved with the participants conducted the survey, the potential for bias is present. Moreover, the study did not include the teacher's perspective, as the first author implemented the intervention. Finally, the reliance on informal note-taking rather than standardized methods could also have introduced variability in the findings.

Practical Implications

Despite the limitations discussed in the previous section, the study findings strongly indicate that video modeling can be highly effective in teaching mathematical concepts, particularly in situations where teachers lack sufficient time to give struggling students individual attention. Notably, the intervention is easily accessible for users of varying technological proficiency, as demonstrated by all the seventh graders assessed in our study who seamlessly accessed the instructions. In addition, it offers students the flexibility to engage with instructional content through widely available technologies (e.g., laptops, desktops, tablets, smartphones) and in various settings, such as classrooms, resource rooms, or at home. The format also allows individuals to control their progress by playing, pausing, and replaying instructional information to review and reinforce previously learned material, which is particularly valuable for preparing them for more advanced coursework in high school (Cihak & Bowlin, 2009). This flexibility also fosters autonomy and self-determination, key skills that are critical as students mature (Satsangi et al., 2020).

In summary, as Morris et al. (2022) highlight, one of the greatest strengths of video modeling is its ability to help teachers support multiple students with varying needs simultaneously. Hence, this strategy is particularly valuable in heterogeneous learning environments that require intensive support. Therefore, the benefits of this approach cannot be overstated.

Future Research and Conclusions

Replication studies are essential when employing a single-case methodology to assess the generalizability of interventions (Tate et al., 2016). In this case, further research is necessary to evaluate the effectiveness of video modeling for teaching mathematics to students with learning disabilities. Larger and more diverse samples would enhance the findings' external validity. Understanding the long-term impact of combining instructional methods requires future studies to include sufficient maintenance probes and multiple follow-up measurements over extended periods (Grünke & Barwasser, 2024; Morris et al., 2022). Comparative studies are also needed to determine whether face-to-face explicit instruction leads to better outcomes than video modeling (Satsangi et al., 2020). In addition, future research should examine the effects of using the intervention in other disability groups and for students without disabilities, such as those with specific difficulties in mathematics (Morris et al., 2022).

In summary, video modeling interventions are a valuable instructional strategy that benefits both students and teachers. They provide students with the flexibility and autonomy to enhance their learning and offer teachers a practical tool for addressing diverse student needs. By enabling student control and supporting differentiated instruction, video modeling can improve educational practices and help integrate research and practice.

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