ABSTRACT

NEWSON, NATASHA KALRA. An Evaluation of the Effects of the Accelerating Mathematics Performance with Practice Strategies (AMPPS) Intervention Program When Delivered in a One-on-One Virtual Format. (Under the direction of Dr. John Begeny).

Approximately 59% of 4th graders in the United States lack proficiency in mathematics (NCES, 2019). Despite extensive research suggesting the importance of developing a strong foundation in math in early elementary school, few math intervention programs are available and fewer have been systematically and rigorously evaluated. In response to the need for evidence-based math interventions for elementary-aged students, the Accelerating Mathematics Performance with Practice Strategies intervention program for small instructional groups (AMPPS-SG; Codding & Begeny, 2022) was developed, and recent research has demonstrated its effectiveness with elementary-aged students. A complementary version of AMPPS-SG is the version of the program that can be implemented one-on-one (adult and student). The present study was the first to evaluate the one-on-one version of AMPPS and specifically examined its effectiveness when delivered to second- and third-grade students 3 times per week over the course of 10 weeks. Furthermore, this study examined the impact of this AMPPS intervention when implemented virtually (i.e., V-AMPPS-1:1) during the summer months. Virtual implementation was influenced by widespread school closures and safety measures associated with the COVID-19 pandemic, but regardless of the prevalence of remote schooling into the future, greater understanding surrounding virtual delivery of a mathematics intervention will have important implications. A multiple baseline design across participants was employed. Results suggest that the majority of students exhibited significantly improved math fact fluency as a result of receiving V-AMPPS-1:1, although variability in responsiveness across participants was present.

An Evaluation of the Effects of the Accelerating Mathematics Performance with Practice Strategies (AMPPS) Intervention Program When Delivered in a One-on-One Virtual Format

by
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DEDICATION

This work is dedicated to my husband, Ryan, who has shown me unconditional support since we met over a dozen years ago. I couldn't do it without you.

BIOGRAPHY

Natasha K. Newson was born on June 23, 1993 in Hackensack, NJ. She graduated from Lenape Valley Regional High School located in Stanhope, NJ in 2011. She attended Bates College in Lewiston, ME for her undergraduate studies, where she double-majored in Psychology and Mathematics. After graduating *summa cum laude* from Bates in 2015, she worked as a lab manager at Harvard University's Laboratory for Developmental Studies and then as a data analyst at a start-up in NYC. Natasha is now pursuing her Ph.D. in School Psychology at North Carolina State University. She is also involved in the Educational Research and Partnerships for Academic Success (ERPAS) team, which is centered around advancing educational equity by improving academic outcomes for children through community-engaged scholarship, research, and evidence-based practice.

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Introduction

When students lack a strong foundation in mathematics, this can be detrimental to their success later in school as well as later in life. Unfortunately, the most recent national assessment revealed that 59% of 4th graders lack proficiency in mathematics (National Center for Education Statistics [NCES], 2019). Students who fall behind in math during early grades tend to stay behind in later grades (Nelson & Powell, 2018) and it is therefore not surprising to see that 66% of 8th graders in the U.S. lack proficiency in mathematics (NCES, 2019). Similarly, in their analysis of over 100,000 students' end-of-grade benchmark exams, Dougherty and Fleming (2012) found that 90% of fourth-grade students identified as "far off track" in math (i.e., more than one standard deviation below the score associated with a 50% or better probability of meeting or exceeding the 8th grade benchmark) did not meet college-readiness benchmarks in math by 8th grade, and 97% of "far off track" 8th graders did not meet college-readiness benchmarks in math by 12th grade. It is clear that as students matriculate to later grade levels, they often do not receive the math intervention and support they truly need, making it progressively more difficult to catch up (Dougherty & Fleming, 2012; Nelson & Powell, 2018).

The consequences of a weak foundation in math are not limited to school. The most recent nationally representative assessment of math competencies for adults showed that one in three adults in the U.S. lacks basic numeracy skills (NCES, 2017). Adults with poorly developed math skills also face fewer college or career options, decreased prospects for future income, and difficulties with everyday tasks, such as calculating change and paying bills (National Mathematics Advisory Panel [NMAP], 2008; Parsons & Bynner, 1997).

Effective Mathematics Instruction

In order to combat low levels of math proficiency and resulting negative outcomes,

students must receive quality math instruction and intervention during early elementary school. Foundational math skills, including counting, number recognition, and number comparisons, predict rate of growth in math achievement in the early elementary years (Jordan et al., 2009), later math achievement (Bailey et al., 2014; Claessens & Engel, 2013), and, as some evidence suggests, later academic achievement more broadly (Duncan et al., 2007). Put simply, developing a strong foundation in math in the early years is important for later success.

Bleak statistics about math proficiency in the U.S. and the importance of quality math instruction in the early grades require educators to ask: *Has there been sufficient research to support educators in selecting and using evidence-based math interventions?* Some evidence suggests there has not yet been enough research to support educators in selecting math interventions that have a high likelihood of being effective. A review of articles published in five major journals from the field of special education from 1999-2004 revealed that, of the 806 articles published during that timeframe, only 10 articles (1.2%) described math interventions with group designs (Seethaler & Fuchs, 2005). A more recent literature review examining the content of all articles published in six major journals of school psychology from 2010-2014 found similar results: of the close to 1,200 articles published during that timeframe, only 12 (1.0%) focused on math interventions (Villarreal et al., 2017).

Of the limited math intervention programs that are available, it appears that very few have been systematically and rigorously evaluated. For instance, as of November 2021, only three supplemental mathematics interventions yielded positive or potentially positive effects according to *What Works Clearinghouse* (WWC), a U.S. government-sponsored source that reviews educational intervention outcomes. Only one of those three interventions has some evidence for use in the early grades (specifically, for K-1 students), but as a strictly online

program where the student engages only with computer technology instead of a person, it has several potential drawbacks (e.g., student engagement or motivation may be negatively impacted, a student's teacher has limited exposure to student challenges and successes outside of data reports, a school's funding could make the needed technology inaccessible). Furthermore, none of the three programs listed within the WWC have positive or potentially positive effects for students in grades 2 and 3. The paucity of available evidence-based programs for elementary school students is concerning given the aforementioned importance of developing a strong foundation early, as well as the strain on resources schools often face that makes resource-intensive interventions (e.g., those requiring the purchase of expensive software) inaccessible.

Despite there being a relatively small number of published studies examining math instruction and intervention, there has been enough research across numerous disciplines to offer insight into which math instructional models, strategies, and components seem to be the most effective. Two overarching instructional models are important to consider: explicit instruction and strategy instruction. Explicit instruction involves a teacher modeling for students how to solve specific problems with step-by-step demonstration as well as opportunities for guided practice, corrective feedback, and frequent review and maintenance checks (Codding et al., 2017; Gersten, Chard, et al., 2009; NMAP, 2008; Swanson, 2009). Strategy instruction is characterized by a teacher using visual and verbal prompts to model problem-solving strategies – focusing on the reasoning and process of problem solving, rather than specific problems as in explicit instruction – as well as reminding students to use those strategies when solving problems (Codding et al., 2017; Swanson, 2009). Research suggests that math interventions that utilized a combination of direct instruction and strategy instruction yielded larger effect sizes ($d = 0.58$) than did math interventions utilizing only one model ($d = 0.48$ for direct instruction, $d = 0.32$ for

strategy instruction) or neither model (d = 0.26; Swanson, 2009).

Although these two models are useful for a broad level of understanding, they are less useful when trying to identify specific efficacious instructional practices that can be utilized with students. There are numerous instructional strategies that are associated with each model (sometimes both models), and several research summaries and meta-analyses have provided additional insight into which strategies are the most effective. A summary of those strategies found to be most effective, including a brief description and a list of references, can be found in Table 1. Research suggests that combining multiple strategies (e.g., at least 3; Codding et al., 2011 [phi = 0.68]; Swanson & Sasche-Lee, 2000) produces larger effect sizes than using fewer strategies.

Accelerating Mathematics Performance with Practice Strategies (AMPPS) Programs

One example of an intervention that packages together multiple evidence-based strategies into a single program is Accelerating Mathematics Performance with Practice Strategies (AMPPS), which has been developed as a small-group intervention program (AMPPS-SG; Codding & Begeny, 2022) and more recently an individualized (one-on-one) program. The overall goal of both AMPPS programs is to improve whole number knowledge, including computation and word problem solving, as well as confidence in these types of skills, for elementary-aged students with low achievement in mathematics.

The instructional curriculum is currently comprised of eight units, each focusing on a specific skill (e.g., addition with sums 0 to 10, subtraction with minuends 0 to 10, addition and subtraction fact families with numbers 0 to 10, addition and subtraction with numbers 11 to 18). The units are intentionally sequenced to ensure that all necessary prerequisite skills are taught and mastered prior to moving on to a new skill. Each unit is further divided into three lessons,

each of which is made up of two to six sub-lessons. One sub-lesson is implemented per instructional session and each sub-lesson focuses on a specified set of math facts.

As will be described in more detail later, AMPPS is unique in comparison to other math interventions in two key ways: (a) AMPPS integrates all of the known evidence-based strategies for improving math outcomes presented in Table 1, and (b) AMPPS integrates motivational strategies, the efficacy of which have been generally under-studied yet are still recommended for use in math interventions (Codding et al. 2017; Gersten, Beckmann et al., 2009; NMAP, 2008).

Experimental research to date has examined only the AMPPS program designed for small-group instruction (i.e., AMPPS-SG) and the first two studies focused specifically on evaluating the use of motivational strategies in addition to its evidence-based instructional strategies. In the initial study evaluating AMPPS-SG (Codding et al., 2020), second-grade students identified as needing intervention support according to screening data and teacher referral received the program as a supplement to their core math curriculum for approximately 25 minutes per day, 3 times per week. Each group of students moved through three phases of a multiple baseline design: (a) baseline, (b) evidence-based instructional strategies only, and (c) the full AMPPS-SG intervention (i.e., the same evidence-based instructional strategies as the prior condition in addition to all AMPPS-SG motivational strategies). Groups received sessions (phases b and c) for 9-11 weeks. Overall findings from the study showed that, although some students showed improvements in mixed addition and subtraction fact fluency from baseline to the instructional components alone, students benefitted most from receiving AMPPS-SG (i.e., the combination of evidence-based instructional components and motivational strategies). Students also rated the full set of AMPPS-SG procedures more favorably than the condition in which they only received the instructional components.

In a follow-up to this study, Begeny et al. (2020) evaluated the effectiveness of the specific motivational strategies used in AMPPS-SG. Second-grade students identified as needing intervention support according to screening data received the program as a supplement to their core math curriculum for approximately 25-30 minutes per day, 3 times per week for 14 weeks. A multiple baseline design was employed with the following phases: (a) instructional components only, (b) instructional components in addition to goal-setting, performance feedback, and reinforcement for performance, and (c) the full AMPPS-SG intervention (i.e., all components of phase b in addition to a group-based reward contingency). Results showed that students' performance on probes with mixed addition and subtraction facts was significantly better after receiving AMPPS-SG (i.e., during phase 3) than during phases 1 and 2.

A third study, comparing AMPPS-SG to Foundations, a publisher-generated math curriculum, found that all students made significant progress after receiving 10 weeks of intervention with either program (Codding et al., 2022). Although no statistically significant differences were found in overall performance between the two groups, small effect sizes were found favoring AMPPS-SG on two of the five outcome measures.

In short, the first three studies evaluating the AMPPS Programs indicate that AMPPS has promise as a small-group intervention for improving early-grade students' math fluency. Yet, the limited body of research with AMPPS at this time requires several additional investigations regarding its efficacy and effectiveness, including evaluations that explore efficacy in different contexts or with different populations of students. For instance, aligned with the focus of the present study, it is important to evaluate the effectiveness of the intervention when delivered in a one-on-one instructional format (i.e., AMPPS-1:1), as there are cases in which a one-on-one intervention may be more appropriate than that for a small instructional group (e.g., if there is

only one student in a classroom at a given instructional level or if a student is not responding well enough to small-group intervention and may benefit more from individualized support).

Virtual Implementation of Mathematics Interventions

The emergence of the COVID-19 pandemic during the 2019-2020 school year forced educators to adapt more traditional instructional approaches in order to best serve their students. Virtual instruction is one widely used adaptation. Although some prior research has explored the efficacy of online math instruction and interventions, this research is limited and centers on computer-assisted instruction (CAI) or the delivery of instruction via computer programs (Codding et al., 2017). Several meta-analyses suggest that CAI can be effective for improving academic outcomes in math (e.g., Fletcher-Flinn & Gravatt, 1995; Li & Ma, 2010), particularly when the program (a) incorporates evidence-based teaching practices, (b) corresponds to what is being taught in the classroom, (c) uses data to individualize instruction, (d) provides ongoing feedback to students, and (e) includes engaging and interactive elements, such as games (Codding et al., 2017). However, research also indicates that math interventions utilizing CAI show smaller effect sizes than those in which an adult provides instruction (Kroesbergen & Van Luit, 2003).

What has yet to be explored is the effectiveness of virtual instruction, or the delivery of instruction via computer technology with a live instructor. The distinction between these two modes of online instruction is important: while CAI relies on computer software or websites to teach academic concepts, virtual instruction relies on live interactions between students and instructors, making it more closely related to typical in-person instruction and at the same time offering convenience benefits often associated with CAI. Of interest in the present study is whether virtual instruction may be an effective solution for educators seeking to provide

evidence-based math instruction to students via technology without sacrificing the benefits of in-person instruction (e.g., student-teacher relationships) that are related to academic achievement (Zee et al., 2021) and lost with CAI.

Only one study examining a one-on-one virtual math program for elementary-aged students was identified. In this study, 600 Year 6 students (i.e., final year at primary school, aged 10-11) across 64 schools in the United Kingdom received one-on-one instruction once per week, across 27 weeks, for 45-minute internet-based sessions led by live tutors in Asia (Torgerson et al., 2016). Results indicated that the students receiving the one-on-one virtual tutoring did not outperform students receiving business-as-usual instruction on the end-of-year mandatory national tests. However, one major limitation of this study is that students' abilities, comprehension, and confidence in math were neither evaluated nor monitored; the only quantitative outcome measure was the end-of-year national tests. Anecdotally, though, the teachers and students expressed positive sentiment regarding the virtual instruction, and teachers reported improvement in students' knowledge of math concepts and confidence in math. Clearly, additional research exploring virtual math instruction is warranted in order to better understand the effectiveness and possible benefits.

Learning Loss in Mathematics

There is a general consensus among both researchers and educators regarding the prevalence of summer learning loss—the idea that during the summer months students lose some of the knowledge and skills they acquired during the school year—and evidence suggests that these losses tend to be more significant in math than in reading (Cooper et al., 1996; Quinn et al., 2016). Specifically, a recent study found that, on average, students lose 25-34% of their school-year math gains over the following summer, with some students losing nearly as much as what

they were expected to gain during the school year (Atteberry & McEachin, 2021). The literature also suggests that school-year learning rates are negatively correlated with summer learning loss, such that students who make more gains during the school year experience less (or no) learning loss over the summer months (Atteberry & McEachin, 2021; von Hippel et al., 2018). Conversely, students who make smaller gains during the school year experience more significant losses during the summer, further widening achievement disparities as students continue through their schooling. Some research also points to the role of race/ethnicity and socioeconomic status in explaining the variability in summer learning loss (e.g., Quinn et al., 2016).

Further, a recent systematic review of the literature examining learning loss during the COVID-19 pandemic identified eight published articles examining this phenomenon, seven of which found evidence of student learning loss (Donnelly & Patrinos, 2021). Of the studies that compared learning loss across subjects, greater losses tended to be found in math than in reading (Donnelly & Patrinos, 2021). Even more troubling is the finding that, in half of the identified studies, learning loss was more significant among certain demographics of students. For example, one study found that students whose parents had lower levels of education experienced significantly greater losses (Engzell et al., 2021). Given the recency and ongoing nature of the pandemic, the literature surrounding COVID-19 learning loss is just emerging; however, the aforementioned results suggest that students were not learning at a level commensurate with what would be expected in a typical school year, and that differences in learning may be at least partially attributable to students' demographic characteristics.

Taken together, these literature bases suggest that students, particularly those from marginalized backgrounds, are likely currently experiencing mathematics learning loss due to both summer break and COVID-19. For this reason, the present study sought to support students

during the summer months, with the hope of mitigating some of this learning loss or even improving students' math performance compared to baseline levels assessed toward the end of the students' school year.

Research Questions and Purpose of the Present Study

The purpose of the present study was to explicitly evaluate a recently developed one-on-one virtual program that was adapted from a manualized, evidence-based, math intervention originally developed for small-group face-to-face implementation (specifically, AMPPS-SG). To date, research surrounding AMPPS has focused exclusively on small-group delivery and research surrounding math interventions, more generally, has focused on in-person instruction or CAI. Additionally, I sought to examine the effects of this virtual intervention when implemented during the summer months, in an effort to mitigate the level of learning loss students with learning difficulties often experience.

The primary research question was as follows: Do elementary-aged students receiving AMPPS in a one-on-one virtual format (henceforth referred to as V-AMPPS-1:1) during the summer months improve their fluency with skills targeted by the intervention, as measured with single-case design visual analysis standards and commonly used effect size criteria? As two supplemental research questions, I also asked: (a) Are there indicators of improved math performance across the duration of the intervention as measured by rate of improvement from the baseline phase to the intervention phase? and (b) How acceptable do students find the intervention?

Method

Participants and Setting

Participants were recruited from a virtual academic tutoring clinic in the southeast United

States that is co-facilitated by university faculty and education nonprofit partners. Second- and third-grade students signed up for the clinic who were identified as having difficulties in math (via the screening process outlined in the Procedures section below) were invited to participate in the study. A total of 24 students were screened and 16 students met eligibility criteria. Out of those 16 students, parental consent and child assent were obtained for six students. As a result of frequent absences, difficulties with internet connectivity, and consistent interfering distractions in the home, one of the six students did not receive the intervention as intended. Therefore, the final sample included five students. Three participants identified as female and two as male. Two participants identified as White, one as Black, one as mixed race (Black and Latinx), and one indicated that they preferred not to respond. Two participants (Students 1 and 3) had just completed the second grade and three participants (Students 2, 4, and 5) had just completed the third grade. All participants attended elementary schools that followed a traditional school calendar. Intervention sessions were conducted virtually via Zoom. The study was reviewed and approved by the Institutional Review Board (IRB).

Materials

Assessment Measures

Mathematics Curriculum-Based Measures (M-CBM). Mathematics curriculum-based measurement (M-CBM; Shinn, 2004) addition and subtraction computation probes are 2-minute timed tests in which students are asked to answer as many problems as they can. Each probe has 84 problems with numerals in each item ranging from 0 to 20. For the purposes of virtual administration, each probe was created as a separate Google Sheet. The measure is scored by counting each digit correct, rather than each correct answer. The total number of digits correct is then divided by two to calculate digits correct per minute (DCPM). This scoring was completed

by embedded formulas within the Google Sheets. M-CBM reliability coefficients typically range from .80 to .92 for basic fact measures, and validity coefficients typically range from .40 to .80 across types of M-CBM measures (Foegen et al., 2007). As will be described in the Procedures section, M-CBM addition and subtraction computation probes were used for screening and progress monitoring purposes.

The Kids Intervention Profile (KIP). In order to address the second supplemental research question, regarding how acceptable students find the intervention, the Kids Intervention Profile (KIP; Eckert et al., 2017) was administered to all students post-intervention (i.e., at the conclusion of their last intervention session or three to four days after their last intervention session). The KIP consists of 8 items evaluating intervention acceptability. The items used in this study were adapted from the original KIP (Eckert et al., 2017), which was used for a writing intervention. Each item asked students to respond on a five-point scale ranging from *not at all* to *very, very much* or *never* to *many, many times*. Boxes of increasing sizes accompanied the answer choices to promote understanding. Test-retest reliability for the KIP is .70 and validity coefficients range from .66 to .83 (Eckert et. al., 2017).

Intervention Materials

The version of AMPPS that was used in this study was specifically designed for one-on-one (student-instructor) instruction in a virtual context. The first four units, which focus broadly on simple computation, were utilized in the present study. Materials for each unit include: (a) a protocol, which includes implementation flow charts and materials lists, as well as a brief activity description and key comments for each procedural step; and (b) sub-lesson-specific Google Slides decks, containing instructional materials such as flashcards, number lines, ten frames, and word problems. A Google Sheet containing a graph and tracking form to monitor

student progress, a chart to keep track of math facts learned, and a Star Chart (Begeny, 2009) for motivational procedures was also maintained for each student.

Procedures

Screening

Students were screened with three M-CBM probes (addition, subtraction, mixed addition/subtraction). Students who scored at a mastery or instructional level on all three probes or at a mastery level on the addition probe were excluded from the study. Administration of the M-CBM probes involved screensharing the relevant probe and typing in the student's responses, which were provided verbally. Participants yielded scores ranging from 4.5 DCPM to 13 DCPM on the mixed addition/subtraction probe, suggesting frustration level performance (Burns et al., 2006).

Training Interventionists

Interventionists included myself, another graduate student, and one undergraduate student. All interventionists previously completed coursework on curriculum-based assessment and had at least one year of experience implementing other evidence-based academic intervention programs. As a co-author of the AMPPS curriculum, I have had significant involvement with the development of the AMPPS Programs and was responsible for training the other two interventionists to implement the V-AMPPS-1:1 intervention procedures. Interventionists practiced implementation by taking turns posing as the interventionist or student. Implementation mastery was determined only when each interventionist could implement the full protocol independently and with 100% integrity on both intervention adherence and intervention quality (described later). All interventionists were required to meet this criterion before being able to implement the protocol with a student participant, and implementation integrity with

student participants was continuously monitored.

Intervention

One sub-lesson is implemented per instructional session, which lasts approximately 20-25 minutes. AMPPS instructional components and strategies include modeling, corrective feedback, guided practice, verbalizations, visual representations, explicit timing, flash card drills, cumulative review, and progress monitoring. The majority of intervention components are consistent across units, and those include: (a) the student practices the sub-lesson facts using a conceptual practice strategy (e.g., commutative property, "thinking addition" to solve subtraction), (b) the student practices the sub-lesson facts using an instructional strategy (e.g., number line, ten frame, subitizing), (c) the interventionist facilitates guided practice and monitors intendent practice with word problems, (d) the student responds orally to flash card drill, (e) the student completes a one-minute timed math probe (i.e., a "Sprint"), (f) the interventionist leads the student in correcting the math probe, (g) the interventionist graphs the student's problems correct per minute (PCPM) and problems incorrect per minute (PIPM) from their math probe and provides praise and feedback, (h) the interventionist awards the student stars on a Star Chart based on effort and performance (i.e., meeting their "Sprint Challenge," meaning their PCPM was higher than that in the previous session). However, in three out of the four units that were utilized in this study, there is an additional intervention step that occurs between steps *a* and *b* listed above that involves students coloring in a chart that tracks the math facts that they learned during that sub-lesson. Finally, the sub-lessons within the Review Lesson (Lesson 3 of all units) replace steps *a* and *b* above with a review game.

All sub-lessons are completed sequentially until the Review Lesson, at which point student performance is utilized to determine if they should progress to the subsequent unit or

receive additional practice within the current unit. Mastery is assessed with curriculum-embedded probes that are aligned to the skills of the lesson. If a student meets the unit-specific problems correct per minute and problems incorrect per minute criteria during a sub-lesson within the Review Lesson, they advance to the next unit in the curriculum. If a student does not meet the fluency criterion, an additional sub-lesson within the Review Lesson is completed, and up to three review sub-lessons can be completed per unit. If a student completes all three review sub-lessons, they proceed to the next unit, regardless of whether or not they meet the fluency criteria.

Progress Monitoring of Students' Computation Fluency

Mixed addition/subtraction M-CBM probes were used for progress monitoring to evaluate progress throughout the intervention. These probes were not the same as the curriculum-embedded probes mentioned above and therefore students were not specifically practicing the content within these progress monitoring probes. During both the baseline and intervention phases, students were administered an M-CBM progress monitoring probe twice per week (i.e., Mondays and Thursdays) at the start of their session. As with the M-CBM screening probes, the administration of the M-CBM progress monitoring probes involved the interventionist screensharing the probe and typing in the student's responses, which were provided verbally. The data collected from these progress monitoring probes served as the primary dependent variable within the multiple baseline experimental design.

Experimental Design and Conditions

A multiple baseline across participants design was used to answer the primary research question and assess for causality. Single-case designs (SCDs) have a long history of use in the fields of psychology and education, specifically in applied and clinical settings, and involve

"repeated, systematic measurement of a dependent variable before, during, and after the active manipulation of an independent variable" (Kratochwill et al., 2010, p. 2). In SCDs, each participant serves as their own comparison, therefore controlling for potential confounding variables across participants. In order to make causal claims, the pattern of results must suggest that changes in the dependent variable are related to the introduction of the independent variable, and this pattern must be replicated multiple times as part of the study design. In a multiple baseline across participants design (i.e., the experimental design used in the present study), in order to claim a causal relationship between changes in the dependent variable (e.g., DCPM on M-CBM probes) and the introduction of the independent variable (e.g., V-AMPPS-1:1), the effect would need to be replicated across different participants. This replication of the effect helps to guard against threats to internal validity, and current guidelines recommend a minimum of three replications across cases (i.e., participants; Kratochwill et al., 2010). SCDs such as multiple baseline designs are widely considered within psychology and education as rigorous experimental designs that allow for an in-depth understanding of treatment effects (Kratochwill et al., 2010; Normand, 2016).

The design in this study included a baseline condition, where students did not receive V-AMPPS-1:1, and instead received an evidence-based reading intervention (HELPS; Begeny, 2009) also delivered virtually. A description of HELPS is beyond the scope of this manuscript, but several publications have described this reading intervention and have evidenced its effectiveness in improving students' reading fluency and comprehension (e.g., Begeny, 2011; Begeny et al., 2010; Begeny et al., 2011). Important to note, one study (Mitchell & Begeny, 2014) showed that although HELPS significantly improved students' reading when implemented during the summer months, the participants in that study did not show improvements in math. In

other words, there is no reason to suspect that HELPS would have an impact on students' math skills and is one reason this intervention was used during the baseline condition. Additionally, this intervention was provided during baseline because students in the virtual academic clinic had been receiving the HELPS intervention throughout the school year and we wanted students to continue receiving meaningful educational support during the baseline condition for this study, rather than simply receiving baseline assessments and waiting for the math intervention condition to begin.

The baseline condition was followed by the intervention condition, where students received V-AMPPS-1:1. Participants were randomly assigned to the design's staggered intervention start points (i.e., 5, 6, 7, or 8 baseline sessions; Kratochwill & Levin, 2010). This procedure for randomization within a multiple baseline across participants design is consistent with past recommendations and was ultimately utilized because it can strengthen the validity of single-case designs (Kratochwill & Levin, 2010). However, students who exhibited an increasing trend in their baseline data remained in the baseline condition until their data stabilized or until 10 baseline data points were collected, whichever came first. The decision to begin the intervention condition after no more than 10 baseline data points was made out of concern for providing targeted math intervention to students who need it and starting the intervention within a reasonable period of time.

Procedural Integrity

As aforementioned, embedded formulas were utilized to score the M-CBM progress monitoring probes. I created the formulas, and a trained member of the research team independently checked the accuracy of the formulas. To evaluate procedural fidelity, 30% of all implemented sessions were observed by a member of the research team who was trained and

verified in all V-AMPPS-1:1 procedures. Fidelity was assessed by using a structured checklist to evaluate both intervention adherence (i.e., whether the core procedures were implemented as intended) and intervention quality (i.e., how well the procedures were implemented; Sanetti & Collier-Meek, 2014). As shown in the Appendix, the checklist specifies core procedures at the top and items related to intervention quality immediately afterward. Across interventionists, the mean intervention adherence was 98.6% (*range,* 88.9% to 100%) and the mean intervention quality was 98.7% (*range,* 86.7% to 100%).

Data Analysis Strategy

Using the M-CBM progress monitoring probes, DCPM across baseline and intervention phases was graphed for each student and analyzed visually. Consistent with recommendations, the level, trend, variability, immediacy of effect, overlap, and consistency of data patterns within and between phases was examined (Kratochwill et al., 2013). Additionally, Tau effect sizes were computed to supplement the visual analysis. Specifically, Tau-U (Parker et al., 2011) was selected because it evaluates both nonoverlapping data and trends during intervention, while also controlling for trends during baseline if present. Interpretation of Tau effect size metrics are as follows: small (.00-.20), moderate (.20-.60), large (.60-.80), and very large (.80-1.00; Vannest & Ninci, 2015).

Additionally, overall growth in students' math skills across the duration of the project was examined. The extant research regarding expected rates of improvement (ROI) in the area of math is not as robust as in reading, but relevant research exists. Fuchs and colleagues (1993) were some of the first researchers to examine expected ROI on M-CBM and identified a weekly increase of 0.30 DCPM per week as realistic for first, second, and third graders. However, this finding assumes linear growth throughout the school year. One study found winter to spring

growth on M-CBM to exceed fall to winter growth for third graders across two school years, with average weekly growth rates of 0.27 and 0.45 DCPM in the fall versus 0.89 and 0.90 in the spring (Graney et al., 2009). Another study found the same pattern for third graders, but the opposite for second graders (i.e., growth from fall to winter exceeded growth from winter to spring; Keller-Margulis et al., 2014). The latter finding for second graders on M-CBM aligns with findings in the area of reading (e.g., Ardoin & Christ, 2008). Given that the present study was conducted over the summer, there is no clear precedent for expected ROI. Therefore, to analyze data associated with the supplemental research question pertaining to ROI, the decision was made to apply the expected ROI from Fuchs et al. (1993), which was not specific to time of year. Each participant's actual growth was calculated by finding the difference between their average DCPM on the M-CBM progress monitoring probes during baseline and during intervention and then dividing that difference by the total number of weeks of intervention (i.e., 10). The participants' observed growth rates were then compared to the expected growth rate (i.e., 0.30 DCPM).

Finally, descriptive statistics were reported for students' acceptability ratings and interpreted according to the Likert scales associated with the respective survey items.

Results

The findings are discussed according to each research question, and, within those questions, according to the different forms of analysis.

Do Elementary-Aged Students Receiving V-AMPPS-1:1 During the Summer Months Improve Their Fluency with Skills Targeted by the Intervention?

Visual Analyses

Figure 1 shows the digits correct per minute (DCPM) for each student across the baseline

and intervention conditions. Baseline performance was relatively stable for Students 1, 3, and 4. Student 2's baseline performance demonstrated an initial increasing trend but then stabilized somewhat, although variability was still present. Student 5's baseline performance was notable for an increasing trend. Therefore, despite being randomly assigned to receive 8 baseline sessions, Student 5 received 10 baseline sessions (for reasons described previously in the experimental design section).

Academic interventions do not typically result in immediate changes in level, as the student is learning a new intervention program (Barnett et al., 2004), and therefore, dramatic immediate improvements from baseline to intervention were not expected. Visual analyses indicate that the overall level of performance was higher during intervention than baseline for all five participants, as further evidenced by an increase in mean DCPM from the baseline phase to the intervention phase for all participants. Additionally, all five participants had a mean score during the baseline condition that fell within the frustration range of performance (Burns et al., 2006). As illustrated in Table 2, two participants (Students 2 and 5) had a mean score during the intervention condition that fell within the instructional range of performance.

Trends during intervention were variable across students. Student 1's intervention performance saw a relatively immediate increase, followed by significant variability resulting in an overall flat trend. Student 2 saw an immediate increase in DCPM, followed by some variability, and then an increasing trend. Student 3 and Student 4 both demonstrated some variability and a gradual increasing trend. Student 5's intervention performance saw significant variability and a slightly decreasing trend.

Tau Analyses

Table 3 provides effect size comparisons between performance in the baseline phase and

performance in the intervention phase for each student. Aligned with guidance from previous literature (e.g., Vannest & Ninci, 2015), baseline corrections were utilized for Students 1, 2, 4, and 5. Tau coefficients indicate a large improvement for Student 4 and a very large improvement for Students 2 and 3, all of which were statistically significant. For Students 1 and 5, Tau coefficients were in the moderate range and not statistically significant. Further, results suggest a large and statistically significant improvement from the baseline phase to the intervention phase across all students.

Are There Indicators of Improved Math Performance Across the Duration of the Intervention as Measured by Rate of Improvement from the Baseline Phase to the Intervention Phase?

Table 4 shows each student's average rate of improvement from baseline to intervention on the M-CBM progress monitoring probes. Four of the five students had ROIs greater than 0.30 DCPM. In other words, the majority of students demonstrated weekly growth greater than would be expected according to prior literature that estimated second and third grade students' DCPM during the school year (Fuchs et al., 1993). Additionally, across all five students, a weekly growth rate of 0.39 DCPM was observed, which is greater than the expected growth rate of 0.30 DCPM. As discussed later, these findings must also be considered in light of many studies showing that elementary-aged students' math performance commonly declines during summer months (Atteberry & McEachin, 2021; Cooper et al., 1996; Quinn et al., 2016).

Summary of Findings

Taken together, the previously presented results suggest that, overall, most students demonstrated clear benefit from receiving V-AMPPS-1:1. Specifically, Students 2, 3, and 4 demonstrated growth as evidenced by improved DCPM from baseline to intervention according

to visual analyses, Tau analyses, and weekly ROI. Student 5 showed only moderate growth according to Tau analyses but demonstrated higher than expected growth in weekly ROI as well as an increase from a frustration to instructional level. Student 1 showed the least amount of growth according to the three analytic methods but did have a moderately higher average DCPM during intervention compared to baseline.

How Acceptable Did Students Find the Intervention?

Table 5 summarizes students' mean acceptability ratings on each item of the KIP. Participants generally found the intervention acceptable. For example, three of the five students answered *very, very much* and one answered *a lot* in response to the question "How much do you like practicing math problems with us?". Similarly favorable ratings were also provided for an item that asked how much they think using different strategies (e.g., ten frames, number lines, subitizing) helps them to solve math problems. When asked if they thought their addition and subtraction had gotten worse, all five students responded *not at all* and, in contrast, when asked if their addition and subtraction improved, two students answered *very, very much,* two answered *a lot*, and one answered *some*. Participants provided the least favorable ratings for an item asking how much they liked being online to answer math problems, with two students indicating *not at all*, one indicating *some*, one indicating *a lot*, and one indicating *very, very much*.

Discussion

The purpose of this study was to systematically examine the impact of elementary-aged students receiving an evidence-based math intervention, delivered in a one-on-one virtual format (i.e., V-AMPPS-1:1), during the summer months. To date, there is relatively little research focused on evaluating math intervention programs for second and third graders and no known published research on early elementary math programs that have been delivered virtually with a

live instructor. Given that students with low proficiency in math often are not receiving the evidence-based support in school that they need in order to catch up (Dougherty & Fleming, 2012; Nelson & Powell, 2018), and are then more likely to experience learning loss over the summer months (Atteberry & McEachin, 2021; von Hippel et al., 2018), identifying effective instructional programs that can be feasibly implemented and utilized during the summer is important.

Overall, all participants' addition and subtraction fluency improved during the V-AMPPS-1:1 intervention phase, as measured by descriptive statistics, visual analysis, and/or Tau analyses, with three of the five students showing particularly large effects from the Tau effect size analyses. Supplementary analyses examining weekly rate of improvement also illustrated that, over the course of the intervention, four out of five students demonstrated greater than expected growth on M-CBM according to prior research that evaluated school-year ROI for early elementary students (e.g., Fuchs et al., 1993; Keller-Margulis et al., 2014). Consistent with earlier research that examined the change in students' math performance as a result of receiving the small-group in-person version of AMPPS (i.e., AMPPS-SG; Begeny et al., 2020; Codding et al., 2020; Codding et al., 2021), the present study found improved math fact fluency as a result of receiving V-AMPPS-1:1. These findings suggest that the AMPPS program may be effective for students both when delivered in a small-group context and when delivered in a one-on-one context. More generally, the findings of the present study are also consistent with prior research suggesting that utilizing multiple evidence-based instructional strategies can be an effective means of improving math performance (Codding et al., 2011; Swanson & Sasche-Lee, 2000).

However, these results are unique, as they offer preliminary findings showing that a mathematics intervention program targeting addition and subtraction fluency can be effective

when delivered virtually over the summer months. All five students' improvement during the summer months should not be understated. In light of the literature on summer learning loss, which suggests that a loss of skills over the summer months is the norm for many students, particularly in the domain of math for students who have math difficulties (e.g., Cooper et al., 1996; Quinn et al., 2016), a small improvement or even maintenance of skills is noteworthy.

Because three of the five students showed relatively larger improvements from receiving V-AMPPS-1:1, it is important to consider possible factors that may have influenced the performance of students for whom the same level of growth was not observed. Student 1 showed a modest improvement in level from baseline to intervention; however, their performance was notable for variability and their weekly growth rate of 0.12 DCPM was the only ROI that fell below what would be a school-year expected ROI of 0.30 DCPM. Although explicitly measuring each student's on-task behavior and level of engagement during intervention sessions was not a goal of this study, it is worth highlighting that, anecdotally, Student 1 experienced some difficulties with attention and engagement and these difficulties were relatively more challenging for interventionists to address compared to any instances when other students may have been off task.

Additionally, although Student 5 showed an overall increase in level of performance at the beginning of the intervention phase and exceeded the expected ROI of 0.30 DCPM, this student also had variability in performance throughout the intervention phase, particularly during the last six sessions. Although causal explanations cannot be made in the present study to understand this variability, I want to note that this was the one participant who experienced a change in interventionist halfway through the intervention phase (i.e., at Session 18 in Figure 1). Although fidelity across all interventionists in this study was high, there is a possibility that

Student 5's rapport with their new interventionist was not as strong as with their initial interventionist, which could have contributed to more variability in performance. Further, although all participants received roughly the same number of V-AMPPS-1:1 sessions (i.e., 26-30), due to a variety of factors including delayed start date, longer baseline period, and absences, Student 5's sessions extended longer into the summer than the other four participants. Again, causal explanations cannot be made, but possible fatigue of summer work is a plausible consideration for Student 5's variable performance, particularly at the end of the intervention phase.

Finally, both Student 1 and Student 5 did not have a consistent setting from which to join intervention sessions, sometimes joining from a couch, a staircase, a bedroom, or another family member's house. Prior research points to the positive impact on math achievement when students have home-based resources such as a consistent quiet place and desk at which to complete work (Kitsantas et al., 2011). In other words, one's environment influences their learning outcomes, and it is possible that the inconsistent or less optimal home-based learning environment for Students 1 and 5 may have negatively influenced their engagement and level of growth during the study. Future research would be needed to experimentally examine the impact of home learning environment on virtual AMPPS delivery, but I highlight this as another potential variable that was unique to Students 1 and 5, and reasonably could have influenced their performance. Factors relevant to students' differing levels of improvement will also be discussed later in terms of study limitations and future research directions.

Another important finding in this study was that students generally found V-AMPPS-1:1 acceptable. Specifically, students reported that using different practice strategies (e.g., ten frames, number lines, subitizing activities) helped them to solve math problems. Prior research

has emphasized the importance of utilizing multiple instructional strategies from the standpoint of improving math outcomes (Codding et al., 2011; Swanson & Sasche-Lee, 2000), but not necessarily from the standpoint of student acceptability. Therefore, it seems relevant to note that students also seem to enjoy using a variety of strategies when learning math facts. Students in this study also reported feeling that they improved their math skills and overall liked working with the interventionists. Although more research is needed to explore students' confidence and self-efficacy as a result of receiving V-AMPPS-1:1, the fact that students reported feeling that their skills improved is promising, as prior research has identified math self-efficacy as one of the best predictors of math performance (e.g., Liu, 2009; Pajares & Miller, 1994). However, results of the acceptability survey suggested that, overall, students were least satisfied by the virtual delivery. This rating may have been influenced by the fact that these students had been attending school virtually for more than a year prior to participating in this study (as a result of pandemic-influenced school closures in the 2020-2021 school year), but additional research is needed to understand students' satisfaction with virtual intervention delivery during times when schooling is fully or predominantly in person.

Other Study Limitations and Future Research Directions

Findings of the present study should be interpreted in light of limitations and the need for future research. For example, one limitation of the literature is the absence of research examining the influence of response style on performance on math fact fluency tasks (i.e., M-CBM) when delivered virtually. That is, prior literature has not explicitly compared performance on virtually-delivered M-CBM probes depending on whether students provide answers by typing on a computer, typing on a tablet, writing with a stylus on a tablet, verbalizing, or using some other method. Some research suggests that students perform better on paper-based probes than on

computer- and tablet-based probes (e.g., Aspiranti et al., 2020; Hensley et al., 2017). However, given the newfound prevalence of virtual instruction the impracticality of administering paper-based probes in a virtual context, future research should examine potential differences in performance based on the device and response style used. Fortunately, with the design of the present study, the same response style was utilized from baseline to intervention so that improvements in this dependent variable could be examined.

Additionally, the present study was affected by several somewhat unavoidable challenges associated with delivering intervention outside of a school or more controlled setting. For instance, some participants experienced distractions in the home (e.g., television on in the background, family members talking to them), lack of consistent place from which to join sessions, and technological difficulties (e.g., poor Wi-Fi connectivity sometimes leading to a disruption in the session). The present study did not specifically examine on-task engagement; however, at least one participant (Student 1) was noticeably less engaged than other participants and did not respond as well to the motivational strategies embedded within the intervention that are intended to increase student engagement. Prior research evaluating the AMPPS Programs suggests that the embedded motivational strategies have a positive impact on student performance (Begeny et al., 2020; Codding et al., 2020); however, not all students can be expected to respond equally to any one set of strategies. Further, the utility of these motivational strategies in a virtual context has not been explicitly evaluated. The question of how to best enhance focus and motivation in a virtual setting should be explored in future research, as low engagement or motivation is generally associated with poorer academic performance (e.g., Finn et al., 1995; McBreen & Savage, 2021) and currently there is very little research that has examined motivational strategies that are used during synchronous, virtual instruction.

Given the results of the acceptability measure used in this study, particularly the finding that virtual delivery was the least acceptable aspect of V-AMPPS-1:1 according to participants, additional research surrounding both the efficacy and acceptability of virtual academic interventions is clearly warranted. More generally, further research is needed to understand possible impacts of AMPPS-1:1, both when delivered in-person and virtually, and the potential for differing impacts on students with different characteristics (e.g., grade level, ability level at the start of intervention).

Implications for Practice

Despite contextual challenges, limitations of this study, and a general need for additional research in this area, it is worth reiterating that, overall, participants in this study appeared to benefit from the V-AMPPS-1:1 intervention and generally perceived the experience positively. Results from any one study should not be over-generalized, but the promising findings in this evaluation of V-AMPPS-1:1 could have some important practical implications for school psychologists and other educators. Namely, this study suggests that receiving an evidence-based virtual math intervention during the summer months could effectively improve or maintain many students' fluency with whole number computation.

Insight can also be gleaned from some of the challenges faced in the present study. For example, although making alterations to the motivational strategies embedded within the AMPPS intervention could not be done in this study (because it would have compromised internal validity of the study), in practice, educators and interventionists should be attentive to students' engagement levels and would likely want to adjust or intensify motivational strategies as necessary to meet the needs of every individual student. Because research suggests that student motivation and engagement influences performance and responsiveness to intervention

(e.g., Finn et al., 1995; McBreen & Savage, 2021), interventionists are encouraged to utilize evidence-based interventions as they are designed while also considering how student motivation could be bolstered without compromising program implementation. Indeed, intervention programs like AMPPS offer guidance in the instructor's manual when circumstances call for an educator to use supplemental strategies to improve engagement for a student who is not responding well enough to embedded motivational strategies.

The findings of this study, along with the literature surrounding the importance of one's learning environment (e.g., Kitsantas et al., 2011), also highlight the importance of collaborating with schools and families to ensure that students who receive instruction or intervention in the home setting have as conducive of a place as possible from which to join instructional sessions. In the present study, such discussions were not facilitated with participants' parents or caregivers, but in day-to-day educational best practices, such discussion would likely benefit students.

Although virtual delivery was prompted by the onset of the COVID-19 pandemic, these results also have implications beyond the pandemic. Prior literature suggests that one barrier to intervention implementation commonly cited by teachers is the amount of time required (Long et al., 2016). Further, the need for timely targeted academic interventions, particularly among historically underserved students (Codding et al., 2017; NCES, 2019), is only growing in the wake of the COVID-19 pandemic. The findings of the present study provide preliminary support for the practice of having trained interventionists provide math intervention to students virtually. In other words, any child with a laptop and internet connection could feasibly receive support, thereby providing avenues of support for under-staffed or rural school districts that do not have the time or resources to provide intervention support to all of their students who require it.

Although some resources (i.e., laptop and internet connection) would still be required, virtual intervention delivery may be able to reduce some other barriers to access commonly experienced by historically underserved students and under-resourced districts.

Overall, this study extends the literature on the AMPPS Programs, virtually-delivered math interventions, and math interventions completed during the summer months. Future research is needed to replicate the effectiveness of AMPPS across delivery formats (i.e., one-to-one vs. small group) and modalities (i.e., virtual vs. in-person) in order to determine the generalizability of the results and the population of students that might benefit most from receiving the program.

References

Ardoin, S. P., & Christ, T. J. (2008). Evaluating curriculum-based measurement slope estimates using data from triannual universal screenings. *School Psychology Review, 37*(1), 109–125. https://doi.org/10.1080/02796015.2008.12087912

Aspiranti, K. B., Henze, E. E., & Reynolds, J. L. (2020). Comparing paper and tablet modalities of math assessment for multiplication and addition. *School Psychology Review*, *49*(4), 453-465. https://doi.org/10.1080/2372966X.2020.1844548

Atteberry, A., & McEachin, A. (2021). School's out: The role of summers in understanding achievement disparities. *American Educational Research Journal, 58*(2), 239-282. https://doi.org/10.3102/0002831220937285

Bailey, D. H., Siegler, R. S., Geary, & D. C. (2014). Early predictors of middle school fraction knowledge. *Developmental Science, 17*(5), 775-85. https://doi.org/10.1111/desc.12155

Barnett, D. W., Daly, E. J., Jones, K. M., & Lentz, F. E. (2004). Response to intervention: Empirically based special service decisions from single-case designs of increasing and decreasing intensity. *The Journal of Special Education, 38*(2), 66–79. https://doi.org/10.1177/00224669040380020101

Begeny, J. C. (2009). *Helping Early Literacy with Practice Strategies (HELPS): A one-on-one program designed to improve students' reading fluency.* Helps Education Fund.

Begeny, J. C. (2011). Effects of the Helping Early Literacy with Practice Strategies (HELPS) reading fluency program when implemented at different frequencies. *School Psychology Review, 40*, 149–157. https://doi.org/10.1080/02796015.2011.12087734

Begeny, J. C., Codding, R. S., Wang, J., Hida, R. M., Patterson, S. L., Kessler, S., Fields-Turner, F., & Ramos, K. A. (2020). An analysis of motivation strategies used within the small-

group Accelerating Mathematics Performance through Practice Strategies (AMPPS-SG) program. *Psychology in the Schools, 57*(4), 540–555. https://doi.org/10.1002/pits.22334

Begeny, J. C., Laugle, K. M., Krouse, H. E., Lynn, A. E., Tayrose, M. P., & Stage, S. A. (2010). A control-group comparison of two reading fluency programs: The Helping Early Literacy with Practice Strategies (HELPS) program and the Great Leaps K–2 reading program. *School Psychology Review, 39*, 137-155. https://doi.org/10.1080/02796015.2010.12087795

Begeny, J. C., Mitchell, R. C., Whitehouse, M. H., Harris, C. F., & Stage, S. A. (2011). Effects of the HELPS reading fluency program when implemented by classroom teachers with low-performing second grade students. *Learning Disabilities Research and Practice, 26*, 122–133. https://doi.org/10.1111/j.1540-5826.2011.00332.x

Burns, M. K., VanDerHeyden, A. M., & Jiban, C. L. (2006). Assessing the instructional level for mathematics: A comparison of methods. *School Psychology Review, 35*(3), 401-418. https://doi.org/10.1080/02796015.2006.12087975

Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record, 115*(6), 1-29.

Codding, R. S. & Begeny, J. C. (2022). *Accelerating Mathematics Performance with Practice Strategies (AMPPS-SG): A small-group instructional program designed to improve students' math fluency and conceptual understanding.* Helps Education Fund.

Codding, R. S., Begeny, J., Kromminga, K. R., Edmunds, R. R., Klaft, J., Diggs, C., & Hanson-Burke, A. (2020). Do motivational strategies improve the effects of a small-group math intervention program? *Journal of Applied School Psychology, 36*(3), 235-260. https://doi.org/10.1080/15377903.2019.1682735

Codding, R. S., Burns, M. K., & Lukito, G. (2011). Meta-analysis of mathematic basic-fact fluency interventions: A component analysis. *Learning Disabilities Research & Practice, 26*(1), 36–47. https://doi.org/10.1111/j.1540-5826.2010.00323.x

Codding, R. S., Kromminga, K., Edmunds, R., Klaft, J., Ruedy, A., Pulles, S., Begeny, J. C. (2022). *Evaluating a standard protocol intervention package to improve mathematics outcomes.* Manuscript in preparation.

Codding, R. S., Shiyko, M., Russo, M., Birch, S. Fanning, E. & Jaspen, D. (2007). Comparing mathematics interventions: Does initial level of fluency predict intervention effectiveness? *Journal of School Psychology, 45,* 603–617. https://doi.org/10.1016/j.jsp.2007.06.005

Codding, R. S., Volpe, R. J., & Poncy, B. C. (2017). *Effective math interventions: A guide to improving whole-number knowledge.* New York, NY: The Guilford Press.

Cooper, H., Nye, B., Charlton, K., Lindsay, J., & Greathouse, S. (1996). The effects of summer vacation on achievement test scores: A narrative and meta-analytic review. *Review of Educational Research, 66*(3), 227-268. https://doi.org/10.3102/00346543066003227

Donnelly, R., & Patrinos, H.A (2021). Learning loss during Covid-19: An early systematic review. *Prospects*. https://doi.org/10.1007/s11125-021-09582-6

Dougherty, C., & Fleming, S. (2012). *Getting students on track to college and career readiness: How many catch up from far behind?* ACT Research Report Series. Iowa City, IA: ACT, Inc.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C.

(2007). School readiness and later achievement. *Developmental Psychology, 43*(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428

Eckert, T. L., Hier, B. O., Hamsho, N. F., & Malandrino, R. D. (2017). Assessing children's perceptions of academic interventions: The Kids Intervention Profile. *School Psychology Quarterly, 32*, 268. https://doi.org/10.1037/spq0000200

Engzell, P., Frey, A., & Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. *PNAS Proceedings of the National Academy of Sciences of the United States of America, 118*(17). https://doi.org/10.1073/pnas.2022376118

Finn, J. D., Pannozzo, G. M., & Voelkl, K. E. (1995). Disruptive and inattentive-withdrawn behavior and achievement among fourth graders. *The Elementary School Journal, 95*(5), 421–434. https://doi.org/10.1086/461853

Fletcher-Flinn, C. M., & Gravatt, B. (1995). The efficacy of computer assisted instruction (CAI): A meta-analysis. *Journal of Educational Computing Research*, *12*(3), 219–241. https://doi.org/10.2190/51D4-F6L3-JQHU-9M31

Foegen, A., Jiban, C., & Deno, S. (2007). Progress monitoring measures in mathematics: A review of the literature. *The Journal of Special Education, 41*(2), 121–139. https://doi.org/10.1177/00224669070410020101

Fuchs, L. S., Fuchs, D., Hamlett, C. L., Walz, L., & Germann, G. (1993). Formative evaluation of academic progress: How much growth can we expect? *School Psychology Review, 22*, 27–48. https://doi.org/10.1080/02796015.1993.12085636

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B. (2009). *Assisting students struggling with mathematics: Response to intervention (RtI) for elementary and middle schools (NCEE 2009-4060).* Washington, DC: National Center for

Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Gersten, R., Chard, D. J., Jayanthi, M., Baker, S. K., Morphy, P., & Flojo, J. (2009). Mathematics instruction for students with learning disabilities: A meta-analysis of instructional components. *Review of Educational Research, 79*(3)*,* 1202-1242. https://doi.org/10.3102/0034654309334431

Graney, S. B., Missall, K. N., Martínez, R. S., & Bergstrom, M. (2009). A preliminary investigation of within-year growth patterns in reading and mathematics curriculum-based measures. *Journal of School Psychology, 47*(2), 121-142. https://doi.org/10.1016/j.jsp.2008.12.001

Hensley, K., Rankin, A., & Hosp, J. (2017). Comparing student performance on paper- and computer-based math curriculum-based measures. *Assistive Technology: The Official Journal of RESNA*, *29*(3), 140–145. https://doi.org/10.1080/10400435.2016.1212129

Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early math matters: Kindergarten number competence and later mathematics outcomes. *Developmental Psychology, 45*(3), 850–867. https://doi.org/10.1037/a0014939

Keller-Margulis, M. A., Mercer, S. H., & Shapiro, E. S. (2014). Differences in growth on math curriculum-based measures using triannual benchmarks. *Assessment for Effective Intervention, 39*, 146–155. https://doi.org/10.1177/1534508412452750

Kitsantas, A., Cheema, J., & Ware, H. W. (2011). Mathematics achievement: The role of homework and self-efficacy beliefs. *Journal of Advanced Academics*, *22*(2), 310–339. https://doi.org/10.1177/1932202X1102200206

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M. & Shadish, W. R. (2010). *Single-case designs technical documentation.* What Works Clearinghouse. http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf.

Kratochwill, T. R., Hitchcock, J. H., Horner, R. H., Levin, J. R., Odom, S., Rindskopf, D. M., & Shadish, W. R. (2013). Single-case intervention research design standards. *Remedial and Special Education, 34*(1), 26–38. https://doi.org/10.1177/0741932512452794

Kratochwill, T. R., & Levin, J. R. (2010). Enhancing the scientific credibility of single-case intervention research: Randomization to the rescue. *Psychological Methods, 15*, 122-144. https://doi.org/10.1037/a0017736

Kroesbergen, E. H., & Van Luit, J. E. H. (2003). Mathematics interventions for children with special educational needs: A meta-analysis. *Remedial and Special Education*, *24*(2), 97–114. https://doi.org/10.1177/07419325030240020501

Li, Q., & Ma, X. (2010). A meta-analysis of the effects of computer technology on school students' mathematics learning. *Educational Psychology Review*, *22*(3), 215–243. https://doi.org/10.1007/s10648-010-9125-8

Liu, O. L. (2009). An investigation of factors affecting gender differences in standardized math performance: Results from US and Hong Kong 15 year olds. *International Journal of Testing, 9*(3), 215–237. https://doi.org/10.1080/15305050903106875

Long, A. C., Sanetti, L. M. H., Collier-Meek, M. A., Gallucci, J., Altschaefl, M., & Kratochwill, T. R. (2016). An exploratory investigation of teachers' intervention planning and perceived implementation barriers. *Journal of School Psychology, 55*, 1-26. https://doi.org/10.1016/j.jsp.2015.12.002

McBreen, M., & Savage, R. (2021). The impact of motivational reading instruction on the reading achievement and motivation of students: A systematic review and meta-analysis. *Educational Psychology Review, 33,* 1125-1163. https://doi.org/10.1007/s10648-020-09584-4

Mitchell, C., & Begeny, J. C. (2014). Improving student reading through parents' implementation of a structured reading program. *School Psychology Review 43*(1), 41-58. https://doi.org/10.1080/02796015.2014.12087453

National Center for Education Statistics. (2017). *Program for the International Assessment of Adult Competencies (PIAAC).* Washington, DC: Institute of Education Sciences. U.S. Department of Education. Retrieved from https://nces.ed.gov/surveys/piaac/current_results.asp

National Center for Education Statistics. (2019). *The Nation's Report Card: Mathematics 2019.* Washington, DC: Institute of Education Sciences. U.S. Department of Education. Retrieved from https://www.nationsreportcard.gov/highlights/mathematics/2019/

National Mathematics Advisory Panel. (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel.* Washington, DC: U.S. Department of Education.

Nelson, G., & Powell, S. R. (2018). A systematic review of longitudinal studies of mathematics difficulty. *Journal of Learning Disabilities, 51*(6), 523–539. https://doi.org/10.1177/0022219417714773

Normand, M. P. (2016). Less is more: Psychologists can learn more by studying fewer people. *Frontiers in Psychology, 7*, 934. https://doi.org/10.3389/fpsyg.2016.00934

Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*(2), 193–203. https://doi.org/10.1037/0022-0663.86.2.193

Parker, R. I., Vannest, K. J., Davis, J. L., & Sauber, S. B. (2011). Combining nonoverlap and trend for single-case research: Tau-U. *Behavior Therapy*, *42*(2), 284–299. https://doi.org/10.1016/j.beth.2010.08.006

Parsons, S., & Bynner, J. (1997). Numeracy and employment. *Education + Training, 39*(2), 43-51. https://doi.org/10.1108/00400919710164125

Quinn, D. M., Cooc, N., McIntyre, J., & Gomez, C. J. (2016). Seasonal dynamics of academic achievement inequality by socioeconomic status and race/ethnicity: Updating and extending past research with new national data. *Educational Researcher, 45*(8), 443–453. https://doi.org/10.3102/0013189X16677965

Sanetti, L. M. H., & Collier-Meek, M. A. (2014). Increasing the rigor of treatment integrity assessment: An empirical comparison of direct observation and permanent product review methods. *Journal of Behavioral Education, 23*, 60-88. https://doi.org/10.1007/s10864-013-9179-z

Seethaler, P. M., & Fuchs, L. S. (2005). A drop in the bucket: Randomized controlled trials testing reading and math interventions. *Learning Disabilities Research & Practice, 20*(2), 98–102. https://doi.org/10.1111/j.1540-5826.2005.00125.x

Shinn, M. R. (2004). *Administration and Scoring Manual CBM*, AIMSweb.

Swanson, H. L. (2009). Science-supported math instruction for children with math difficulties: Converting a meta-analysis to practice. In S. Rosenfield, V. Berninger, S. Rosenfield, &

V. Berninger (Eds.), *Implementing evidence-based academic interventions in school settings* (pp. 85–106). New York: Oxford University Press.

Swanson, H. L., & Sachse-Lee, C. (2000). A meta-analysis of single-subject design intervention research for students with LD. *Journal of Learning Disabilities, 33*(2), 114–136. https://doi.org/10.1177/002221940003300201

Torgerson, C., Ainsworth, H., Buckley, H., Hampden-Thompson, G., Hewitt, C., Humphry, D., Jefferson, L., Mitchell, N., & Torgerson, D. (2016). *Affordable online mathematics tuition: Evaluation report and executive summary.* London: Education Endowment Foundation.

Vannest, K. J., & Ninci, J. (2015). Evaluating intervention effects in single-case research designs. *Journal of Counseling & Development, 93*(4), 403–411. https://doi.org/10.1002/jcad.12038

Vannest, K.J., Parker, R.I., Gonen, O., & Adiguzel, T. (2016). Single case research: Web based calculators for SCR analysis. (Version 2.0) [Web-based application]. College Station, TX: Texas A&M University. Retrieved Sunday 6th February 2022. Available from singlecaseresearch.org

Villarreal, V., Castro, M. J., Umaña, I., & Sullivan, J. R. (2017). Characteristics of intervention research in school psychology journals: 2010-2014. *Psychology in the Schools, 54*(5)*,* 548- 559. https://doi.org/10.1002/pits.22012

von Hippel, P. T., Workman, J., & Downey, D. B. (2018). Inequality in reading and math skills forms mainly before kindergarten: A replication, and partial correction, of "Are Schools the Great Equalizer?" *Sociology of Education, 91*(4), 323–357. https://doi.org/10.1177/0038040718801760

Zee, M., Rudasill, K. M., & Bosman, R. J. (2021). A cross-lagged study of students' motivation, academic achievement, and relationships with teachers from kindergarten to 6th grade. *Journal of Educational Psychology, 113*(6), 1208–1226. https://doi.org/10.1037/edu0000574

Table 1

Evidence-Based Mathematics Instructional Strategies

Strategy	Description	References
Sequencing	Sequential introduction of concepts, ensuring that all necessary prerequisite skills are taught and mastered prior to moving on to a new skill	Codding et al. (2017) Gersten, Chard, et al. (2009) [*g* = 0.82] NMAP (2008) Swanson (2009)
Drill	Repeated, isolated practice of individual skills (e.g., with flash cards)	Codding et al. (2011) [phi = 0.92] Codding et al. (2017)
Practice with modeling or guided practice	Practice that includes self-directed (e.g., cover-copy-compare) or teacher-directed modeling; if teacher-directed, teacher leads activity with step-by-step demonstration and students follow along, completing the activity simultaneously	Codding et al. (2011) [phi = 0.71] Codding et al. (2017) Gersten, Beckmann, et al. (2009) NMAP (2008)
Explicit timing/ timed practice	Practice within a specific time limit (e.g., one minute)	Codding et al. (2007) [a] Codding et al. (2017)
Cumulative review	Practice previously-taught skills in order to promote retention and generalization	Codding et al. (2017) Gersten, Beckmann, et al. (2009)
Verbalization	Students are encouraged to explain their approach to solving a particular problem (e.g., through think-alouds and choral responding)	Codding et al. (2017) Gersten, Beckmann, et al. (2009) Gersten, Chard, et al. (2009) [*g* = 1.04] NMAP (2008)
Visual representations	Use of visuals (e.g., number line, ten frame) by teachers during demonstration or by students while solving a problem in order to scaffold learning of abstract ideas (e.g., using a number line to facilitate "counting up" in an addition problem)	Codding et al. (2017) Gersten, Beckmann, et al. (2009) Gersten, Chard, et al. (2009) [*g* = 0.47]

Strategy	Description	References
Formative assessment/ progress monitoring	Daily monitoring of progress on specific skills targeted by the intervention as well as less-frequent assessment of broader grade-level skills	Codding et al. (2017) Gersten, Beckmann, et al. (2009) Gersten, Chard, et al. (2009) [$g = 0.23$] NMAP (2008)
Corrective feedback	Teachers provide students with specific feedback regarding performance, clarifying what the student did correctly and what the student needs to continue to practice	Codding et al. (2017) Gersten, Beckmann, et al. (2009)

[a] Found explicit timing to be particularly useful for students whose fluency level falls in instructional range, and less so for students whose fluency level falls in the frustration range.

Table 2

Mean, Standard Deviation, and Performance Level for Each Student by Phase

Participant	Baseline		Intervention	
	Mean (*SD*)	Performance Level [a]	Mean (*SD*)	Performance Level [a]
Student 1	11.7 (1.4)	Frustration	12.9 (2.4)	Frustration
Student 2	9.8 (3.9)	Frustration	17.6 (4.0)	Instructional
Student 3	5.8 (1.2)	Frustration	9.8 (2.7)	Frustration
Student 4	6.1 (1.7)	Frustration	9.4 (1.8)	Frustration
Student 5	12.2 (4.0)	Frustration	15.5 (3.2)	Instructional

[a] Performance level was determined by applying criteria from Burns et al. (2006).

Table 3

Tau Analyses of Students' DCPM Between Phases

Participant	Baseline vs. Intervention [a]	*p*-value	90% CI	
			LL	*UL*
Student 1	.36 [b]	.227	-.13	.85
Student 2	.85 [b]	.002	.40	1.00
Student 3	.81	.003	.35	1.00
Student 4	.76 [b]	.002	.35	1.00
Student 5	.29 [b]	.216	-.10	.68
Across all students	.61	<.001	.41	.81

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

[a] Calculated using a Tau-U web-based calculator (Vannest et al., 2016). Interpretation of Tau effect size metrics are as follows: small (.00-.20), moderate (.20-.60), large (.60-.80), and very large (.80-1.00; Vannest & Ninci, 2015). [b] Baseline correction used.

Table 4

Mixed M-CBM Rate of Improvement from Baseline to Intervention for Each Student

Participant	Mean DCPM		Change Score	ROI [a]
	Baseline	Intervention		
Student 1	11.7	12.9	1.2	0.12
Student 2	9.8	17.6	7.8	0.78
Student 3	5.8	9.8	4.0	0.40
Student 4	6.1	9.4	3.3	0.33
Student 5	12.2	15.5	3.3	0.33
Across all students	9.1	13.0	3.9	0.39

Note. Fuchs et al. (1993) identified 0.30 DCPM as the expected weekly ROI for second and third graders who were assessed during a school year. Summer ROI in DCPM is not known, but research on summer learning loss suggests many students would decrease in performance over the summer months (Atteberry & McEachin, 2021; Cooper et al., 1996; Quinn et al., 2016).

[a] Calculated by dividing the change score by the total number of weeks of intervention (i.e., 10).

Table 5

Students' Mean Acceptability Ratings and Standard Deviations on Each Item of the KIP

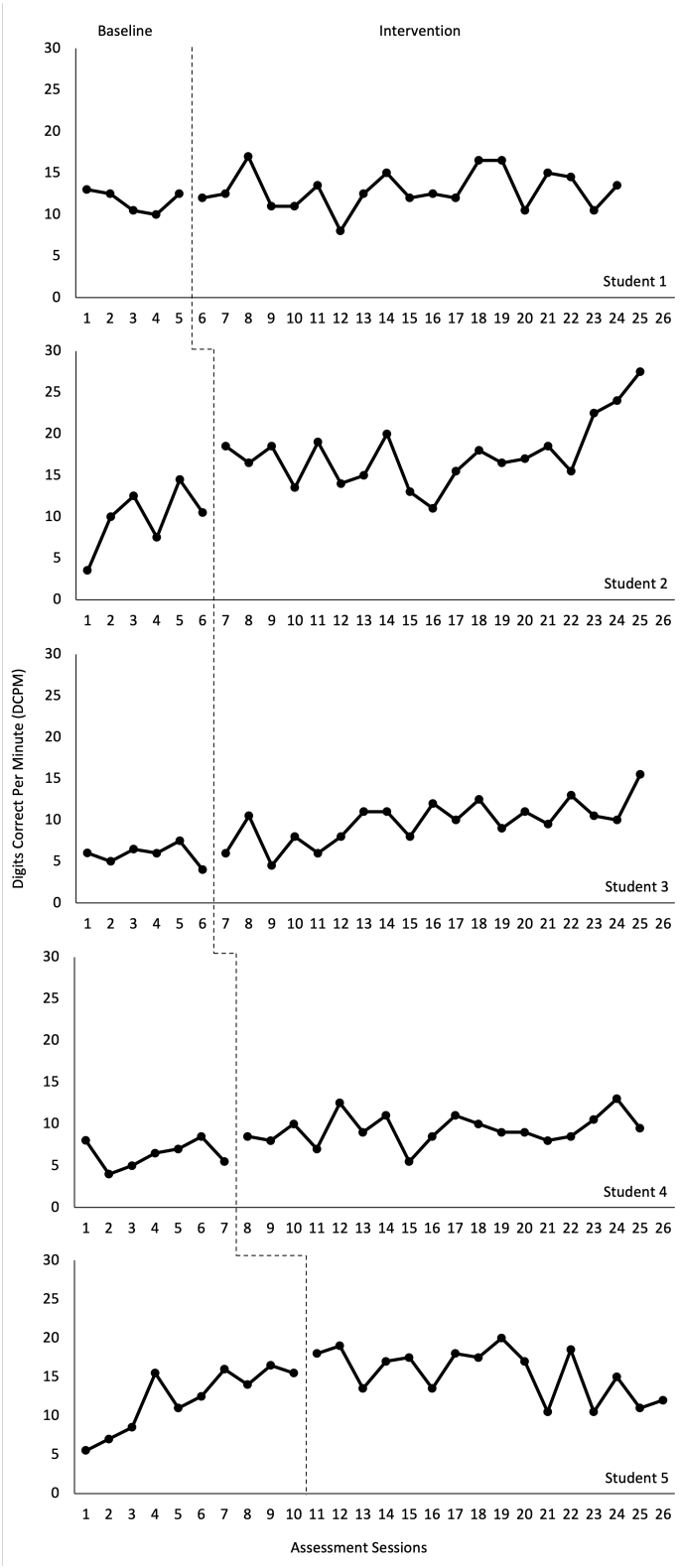
Item	*M (SD)*
1. How much do you like practicing math problems with us?	4.20 (1.30)
2. How much do you like practicing with different strategies to solve math problems?	3.40 (0.89)
3. Were there times when you DIDN'T want to work on math problems with us? [a]	3.20 (0.45)
4. Were there any times when you wished you could work more on math problems with us?	3.00 (1.41)
5. How much do you like being online to work on math problems?	2.80 (1.79)
6. How much do you think using different practice strategies (for example: ten frames, number lines, subitizing) helps you to solve math problems?	4.40 (0.89)
7. Do you think your addition and subtraction have improved?	4.20 (0.84)
8. Do you think your addition and subtraction have gotten worse? [b]	5.00 (0.00)
Total Score	30.20 (1.30)

Note. Items were scored on a scale from 1 to 5, with higher numbers reflecting more positive attitudes and lower numbers reflecting more negative attitudes.

[a] Reverse coded. Four students responded *sometimes* and one student responded *a couple of times* to this item. [b] Reverse coded. All students responded *not at all* to this item.

Figure 1

Digits Correct Per Minute (DCPM) Scores Across Phases



APPENDIX

V-AMPPS-1:1 Implementation Checklist

Implementation of Core Procedures

- The steps relevant to the sub-lesson being observed will be automatically numbered in column A
- Any steps not relevant to the sub-lesson being observed will be grayed out
- Place "Yes" in the box for steps completed with no major errors
- Place "No" in the box for skipped steps or those implemented with major errors
- Place "OOO" in the box for steps implemented out of order

Step #	Y, N, OOO	Core Procedure	Sub-Lesson	Notes
		Introductory Statements and Expectations	All	
		Commutative Property	A1a-A2c, D1a-D1c	
		"Think Addition"	B1a-B2e, D2a-D2c	
		Doubles	A2d, B2f	
		Identify Fact Families	C1a-C2d	
		Facts I Know	A1a-A2d, B1a-B2f, D1a-D2c	
		Instructional Strategy (e.g., Say It, Count It, Frame It, Subitizing, Fact Families)	A1a-A2d, B1a-B2f, C1a-C2d, D1a-D2c	
		Fact Families	D3a-D3c	
		Review Game	A3a-A3c, B3a-B3c, C3a-C3c, D3a-D3c	
		Story Problems with Diagrams	All	
		Lightning Flashcards	All	
		Sprint	All	
		Sprint Review	All	
		Student Graph	All	
		Star Chart/General Motivation	All	
		Student Tracking Form	All	

Percentage of Core Procedures completed correctly %

Implementation of Tips and Reminders

- Place "Yes" in the box for steps correctly completed steps
- Place "No" in the box for skipped steps or those implemented with errors
- Place "N/A" in the box for non-applicable steps

	Step #	Y, N, N/A	Tips & Reminders	Notes
General Implementation Procedure	1		Instructor had the following materials available and organized before starting the session: (1) protocol corresponding to today's unit, (2) flow chart corresponding to today's sub-lesson, (3) Google Slides deck corresponding to today's sub-lesson, (4) student's virtual folder, and (5) stop watch.	
	2		For the first 3-5 sessions with the students, instructor read all of the bolded directions exactly as written in the protocol. After completing 3-5 sessions, instructor abbreviated the directions where appliable.	
	3		Instructor was familiar with all focus facts corresponding to today's sub-lesson and gave corrective feedback on those facts when the student provided an incorrect answer.	
Commutative Property	4		Instructor reviewed the definition of the commutative property (and the additive identity property when necessary; must review both on assigned lessons in Unit A).	
Identify Fact Families	5		Instructor reviewed the definition of a fact family.	
Instructional Strategy	6		Instructor rotated through instructional strategies across sessions (i.e., did not use the same instructional strategy repeatedly across sessions). Note: Unless observing the same instructor often, you may need to ask the instructor directly if they use different instructional strategies each day (per the instructions in the protocol).	
Story Problems with Diagrams	7		Instructor reviewed the attack strategy (i.e., the STAR strategy).	
Sprint	8		Instructor began screen sharing Sprint after reading instructions.	
	9		Instructor circled student's Sprint Challenge. **(Applicable?)**	
Sprint Review	10		Instructor highlighted correct answers provided by the student.	
	11		Instructor crossed out any incorrect answers provided by the student and wrote in correct answers. Correct answers written in by the instructor were not highlighted. **(Applicable?)**	
Student Graph	12		While graphing, instructor gave verbal feedback and praise regarding the student's PCPM and PIPM scores.	
	13		Instructor accurately graphed both PCPM and PIPM.	
	14		If on the first sub-lesson of a new unit (but not the student's first session), instructor inserted a row below the last session of the previous unit and grayed it out, entering the data for today's session below the grayed-out row. **(Applicable?)**	
	15		Instructor told student they met their Math Goal. **(Applicable?)**	
Star Chart/General Motivation	16		Throughout the session, instructor provided a minimum of three different praise statements regarding student's math problem-solving.	
	17		When awarding stars on Star Chart, instructor accurately told student why they earned each star.	
	18		With enthusiasm, instructor provided specific praise (e.g., great job explaining the commutative property; I like how you correctly stated facts you missed previously) and praised student improvements at the end of the session.	
	19		If the student landed on OR passed a shaded square on Star Chart, student was allowed to spin the digital bonus bag wheel and instructor correctly recorded the bonus stars according to where the wheel stopped. **(Applicable?)**	
	20		If the student landed on OR passed the last square in a row on Star Chart, student was allowed to pick and play a game from the Virtual Prize Box for up to 5 minutes. **(Applicable?)**	
	21		Instructor conveyed that improved math skills, rather than the opportunity to earn stars/prizes, is the primary reason the student should put forth effort during each AMPPS session. **(Applicable?)**	
Student Tracking Form	22		Instructor correctly recorded the number of procedural steps missed or implemented incorrectly in the "# of Steps Forgotten" column.	
	23		Instructor recorded relevant information in the Notes column of the Progress Tracking Form (e.g., student difficulties with Story Problems, behavior problems, attention difficulties, etc.). **(Applicable?)**	

Percentage of Tips & Reminders completed correctly 0.0%