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# AVMR One Intervention Implementation

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Abstract

There are a variety of ways to identify a student who may have a specific learning disability in math, or who is just struggling with math. Whether it is cognitive, social / behavioral, or physical characteristics, or through assessment, all these students have one common need, they need a strong intervention to improve their mathematical skills. This intervention should be one that is research-based and supports students who are struggling with math or have a math learning disability. AVMR uses a variety of evidence-based practices including explicit instruction, visual support, and formative assessment to act and adjust to students' needs. Add+ Vantage Math Recovery offers an assessment first approach of improving instruction and intervention for those students who struggle. This project is an implementation of Add+ Vantage Math Recovery's AVMR 1 assessment on a student who lacks the skills to meet the facile constructs that AVMR 1 assesses. Based on the assessment, AVMR intervention was used to improve adding and subtracting strategies and structuring. A post assessment was then implemented to determine AVMR's interventions impact on the student.

According to the National Center for Education Statistics (2021), of the 7.3 million public school students of the 2019-2020 school year who qualify for special education services, thirty-three percent (240,900) of those students qualified under specific learning disability (NCES, Figure 1). Those students who qualify for Specific Learning Disabilities qualify in the areas of reading, writing, or mathematical calculation.

Students who have qualified for specific learning disabilities in math have more than likely been identified using teacher classroom observation, academic success, and universal screening. These forms of identifications can be used to determine if a student would benefit from small group instruction to address students who have similar mathematical needs. If the small group instruction is not meeting a student's needs, special individualized instruction would be developed with the support of an individualized education plan (Minnesota Department of Education, 2021). Students' needs may be specific to learning practices according to common core standards, cognitive characteristics, or behavioral/social characteristics (Common Core State Standards, 2021; Learning Disability Association of America, 2021; Mazzocco & Thompson, 2005).

In order to support students with math difficulties, teachers have to find evidence-based practices that support the student's needs. In Spencer, Detrich, and Slocum's 2012 article, one of their many definitions of evidence-based practices, from the US Department of Education said that evidence-based practices are, "The integration of professional wisdom with the best available empirical evidence in math decisions about how to deliver instruction" (Table 1, p. 130). To support students with math difficulties or math learning disabilities, evidence-based practices (EBP) could include instruction that is delivered in a specific way to promote student engagement and offers frequent feedback. (Hughes et al., 2017; Jayanthi et al., 2008; Steedly et al. 2008). Other forms of EBP could include extension opportunities to allow students to continue their learning in a different format, providing instruction or practice with visual representation to allow students to see math, and constant formative assessment of students to act and adjust instruction. (Jayanthi, 2008).

Add+ Vantage Math Recovery (AVMR) is a research-based intervention that supports students who are struggling with math or have a math learning disability. AVMR uses a variety of evidence-based practices including explicit instruction, visual support, and formative assessment to act and adjust to students' needs. AVMR can be used to guide whole group curriculum instruction, small group, or one-on-one instruction (Math Recovery Council, 2014, pp. 6-13). AVMR has been around since 1993 but has limited research on implementation and its effect on student improvement. AVMR does cover a variety of mathematical practices and skills so assessing implementation and effects on students could be extensive.  For my capstone project, I chose to implement AVMR’s intervention activities and see its effects on individual students who are not “facile” in the skills that AVMR One assesses.

**Characteristics of Math Learning Disabilities**

Characteristics are not the only way to identify students with a learning disability, but there are many commonalities of students' cognitive, social/behavioral, and physical characteristics among students who have learning disabilities. There are many different cognitive characteristics that students with math learning disabilities might display. Students with a math learning disability will struggle with short-term memory. This would look like after a teacher is giving new instruction such as how to solve an equation or strategies related to a previous learning target, a student with a learning disability would not be able to remember what they learned when the teacher formally assesses that new skill. Another characteristic of a math learning disability is poor phonological memory, meaning that the student cannot hold information like numbers or letters for the short term. Students with a learning disability in math also have a hard time grasping new concepts, retrieving new facts, or different strategies other than one they may already know. Students also have a hard time with calculation and spatial reasoning meaning they mix up numbers, letters, and symbols, causing errors in solving. The final cognitive skill that students with learning disabilities might struggle with is executive functioning like staying organized, planning, self-starting, controlling emotions, impulse and emotion control, or being a flexible thinker. (Mazzocco & Thompson, 2005, p. 143).

Students with math learning disabilities might not always have display social and behavioral characteristics, but there are some different skills that students may lack. This could include students' lack of awareness of their social environment and missing social cues from peers and adults in a social situation. Students with learning disabilities might find ways to gain acceptance from students in immature and inappropriate ways to make up for the fact that they receive special education services, and are not in their core classes with the rest of their peers. Seeking this acceptance may also make it hard for students to build relationships with peers. Finally, when given new or challenging content, students with learning disabilities may be easily frustrated which could lead to shutting down or other inappropriate behavior (Learning Disabilities Association of America, *Social Skills and Learning Disabilities.)*

Usually, students with learning disabilities do not have visible physical characteristics, but some physical characteristics could be observed. Poors handwriting and coordination may hinder students' ability to learn. Being able to differentiate letters, numbers, and sounds may be challenging for students with learning disabilities as well (Learning Disabilities Association of America, *Symptoms of Learning Disabilities*).

There are many different cognitive, behavioral, and physical characteristics that teachers may observe, but only part of the process of determining if a student has a learning disability.

**Identifying Specific Learning Disabilities**

There is a combination of different ways to check and assess to determine if students have a learning disability. Most schools have a Multi-Tiered System of Early Intervention and Instructional Support (MTSS) system set up to determine students who may need intervention, or furthermore, special educational supports. The Minnesota Department of Education (MDE, 2021) defined MTSS as a tertiary way for educators to identify learning and behavior challenges early and give students intense intervention based on their challenges (para. 2). Tier-one is where the instruction of a research-based core curriculum takes place that meets the needs of most students in the classroom. At this stage, students are universally screened multiple times throughout the school year to determine where students are at with their learning and determine those who are trending to where there may be a concern (MDE, 2021, para 3). Tier-two supports are provided for students who may be struggling with academics or behavior. Small group instruction backed by evidence-based instruction is how an intervention is implemented. This intervention is usually fifteen weeks long with three to four-thirty minutes sessions a week. Students are frequently progress monitored during intervention sessions to determine if they are making improvements, or if more intervention is needed (MDE, 2021, para. 4). Students are placed into tier three intervention when no progress is being made at tier two. To receive tier-three supports, students have to be qualified for special education supports. Intervention is one-on-one with teachers and is provided daily (MDE, 2021, para. 5).

For Students to qualify for tier three supports, they are assessed for special education services. There are a variety of assessments that can be used to determine a deficit in learning.

An IQ test can be used to check academic ability compared to same-aged peers nationwide (Learning Disability Association of Minnesota, 2020, para. 2). Based on a student's IQ score, Individualized Educational Program (IEP) teams can plan intervention around a student's weaknesses. The Woodcock-Johnson is another flexible assessment that can be used to assess academic ability in a variety of areas. The math portions of the Woodcock-Johnson assess students' ability in broad mathematics, math calculation skills, and math problem-solving (Riverside Insight, 2021). The Wechsler Intelligence Scale for Children (WISC) is used to assess students' visual-spatial abilities, fluid reasoning, working memory, processing speed, and verbal comprehension (Pearson, 2021). There are other assessments used to determine whether students qualify for special education services under learning disabilities, but these are widely used.

**The 8 Standard for mathematical practice – Common Core**

The standards for mathematical practice were developed by the Common Core State Standards Initiative to give a basis of “expertise” that should be taught to and developed by students. These eight principles are the long-lasting math skills Common Core believes are needed to be considered a proficient student in mathematics. The standards were inspired by work from the National Council of Teachers of Mathematics. Their main contribution to these practices is the process of developing the necessary skills. The Nation Research Council report “Adding it Up” contribute their description of what it looks like to be proficient in each standard. Within each standard, each one describes what mathematically proficient students would be able to do by the time they graduate high school, with some references to what elementary students would be able to do when at that age.

The first standard that all students should learn before they graduate is to make sense of problems and persevere in solving them. To be proficient at this stage, students should be thinking about how they should start a problem given to them, and what path they should take to solve that problem. They should be able to self–monitor themselves to solve the problem and be able to determine what to do next, be conscious of making errors, change those errors when identified, and understand any constraints that would limit them from answering the question. The second standard students should be able to do is reason abstractly and quantitatively. A proficient student can decontextualize problems, meaning they can break the problem into numbers and symbols to see as individual pieces of a larger entity. Students are flexible with strategies of solving problems and conscious of different routes to solve a problem successfully. The third standard all students should learn is being able to construct viable arguments and critique the reasoning of others. To develop this standard, students can use preconceived knowledge of mathematics such as vocabulary, results of problems, and strategies to develop and support arguments. Students can make claims, have an educational argument, provide examples and counterexamples, empathize, and reason with students. Fourth, students should be able to model with mathematics. This means that students should have the skills to everyday problems. They can use manipulatives such as physical objects and illustrations to help them answer and show their understanding of mathematical questions. Being able to make adjustments to representation if it does not make sense as well to show their understanding is a skill students have at this standard. The next standard students should be proficient at by the time they graduate is using appropriate tools strategically. When proficient, students can consider all the tools they have learned to solve mathematical problems. A real-life example of this is when students are given a problem that involves finding the distance between two objects, when they have the grade-level skills to measure, they know they need to use a measuring device, like a tape measure, ruler, or yardstick, so find the distance. The sixth standard is that students should be able to attend to precision. A proficient student at this standard pays attention to detail and is precise when measuring and solving problems. Students pay attention to signs and symbols and understand their importance to the problem. At an early age, students should be able to explain their thinking and by high school, students can hear out other students' explanations, and make their claims as well. The seventh standard students should be proficient at is being able to look for and make use of structure. A proficient student who can structure can identify patterns such as patterns or the properties of addition and subtraction. A strong structuring student can be given a problem like 27 + 49, the student can combine the ten's place and get 60., then when adding the 7 and 9, the student can recognize that they are only from another 10, so they take one from the 7 to add to the 9 giving them, 10 with 6 leftovers, and can quickly add 60 + 10 + 6, giving them 76. The student was able to structure to 10 to solve these problems promptly. The final standard that students should be proficient at by the time they graduate is being able to look for and express regularity in repeated reasoning. A proficient student can recognize that a problem is similar to their previous work and use that information to guide them through a future problem. Students can also make sense of their answer and assure that it is reasonable (Common Core State Standard Initiative, 2021).

**Teacher Instruction**

The only way for students to reach proficiency in Common Core's mathematical practices is by teacher instruction. Steedly et al said it best in their 2008 article, "not all children with learning disabilities have math troubles, and not all children with math troubles have a learning disability" (3). Teachers have a responsibility to have a variety of instructional strategies that will benefit students to learn math.

The first instructional strategy, and number one in boy Jayanthi et al and Steedly et al's articles, that teachers should use to support students who struggle with math is explicit instruction. During explicit instruction, teachers start with giving students the learning target (Steedly et al, 2008, p. 4). When teaching the new learning target, teachers are modeling their work and thinking out loud. Once students have are trying problems on their own, teachers are looking around at students' work providing immediate corrective feedback to students to promote accuracy. Teachers are also always formally assessing students to gain an understanding of where they are and build their instruction around students' skills and development of the learning target (Jayanthi et al, 2008 & Steedly et al, 2008). An ongoing formal assessment of students also allows teachers to group and pair students to do small group activities as an enrichment activity and build of new knowledge, or continue to support students who need further instruction (Jayanthi, Gersten, Baker, 2008, p. 10). Teachers' instruction should be sequential with examples that build on each other to promote learning. Students should be exposed to a variety of examples from contract to abstract in order to develop a wide range of skills related to the learning target. Students who are exposed to a wide range of examples allow students to apply knowledge to a wide range of problem types (Jayanthi, Gersten, & Baker, 2008, p.6). During explicit instruction, teachers should promote heuristic, or problem – solving, strategies. This builds students' self-confidence in solving mathematical problems on their own and forces them to use different routes to solve problems based on prior knowledge. To promote heuristic strategies, teachers must teach a variety of ways to solve problems and promote problem-solving through scaffolding so students can do it on their own (Jayanthi, Gersten, & Baker, 2008, p. 9).

Another instructional strategy that teachers should implement for students when teaching math is using visual representation. Visual representations can be used to explain or clarify problems and works best when combined with explicit instruction (Jayanthi, 2008, p. 8). Pictures, manipulatives, number lines, graphic organizers, counters, are just a few of many tools that can be used as visual representations (Steedly et al, 2008, p. 8). For visual representations to work best, teachers should explicitly say when to use visuals to support them when practicing learning targets. Students are more aught to use these visual representations when told to use them, instead of students having to choose when to use them (Jayanthi, Gersten, Baker, 2008, p. 8).

**Add+ Vantage Math Recovery**

Add+ Vantage Math Recovery (AVMR) is an evidence-based intervention to develop or improve numeracy skills through individual instruction. According to the Math Recovery Council (2014), the goal of Math Recovery is "to provide a robust intervention framework for teachers working with elementary students to help in the construction of numeracy skills, through assessment, which incorporates a strong analysis component and individualized teacher" (p.3). Students are assessed by a trained specialist to determine students' current knowledge on early numbers in relation to the Learning Framework in Number, which is a continuum of the concept that students should be proficient at for a given age. Learning Framework in Number starts with unitary strategies which are students' ability to do mathematical operations by counting by ones. As students move across the continuum, they start developing composite strategies, which allow students to regroup parts of a problem to help them solve. While students are working to move from unitary to composite strategies, they are also working on using representational strategies such as fingers or manipulatives, to using mental strategies like structuring mentally and holding values in their head. (Kinsey et al, 2013, pp. 16 – 17). The assessment informs the specialist about the student's current understanding, and what skills need intervention on (Math Recovery Council, pp. 3-4). Intervention is given, typically, in a one-on-one setting to build confidence and develop lacking skills while always adjusting activities as students' skills improve over time. Teachers are constantly informally assessing through observation, hypothesizing about students' current knowledge and strategies related to the learning framework, and selecting learning activities related to current needs (Math Recovery Council, p.6).

When assessing students, AVMR follows a heuristic approach when assessing and performing an intervention with students. Students are questioned on different strategies they can use to solve problems in multiple different ways. When they are not able to problem-solve, then the specialist will take an explicit approach to teach students how to conduct the learning targets of the framework. Specialists allow students to try problems on their own, informally assess their work, and adjust problems based on what they are observing the student does (Jayanthi et al, 2008 & Steedly et al, 2008).

Math Recovery can also be used as a Multi-Tiered System of Early Intervention and Instructional Support. AVMR's assessments can be used as a universal screening to assess all students in the classroom and guide classroom instruction. At tier two, students can be placed into a small group of three students all working on the same skill. Students' abilities would be monitored and intervention would be adjusted over time. If students in small group instruction continue to struggle with learning frameworks, students could receive a more intense one-on-one intervention, making this a tier-three support (Math Recovery Council, p. 17).

## Method

### Participant

The student that was assessed and received AVMR 1 intervention was a nine-year-old female. She is a third at an elementary school in Fargo, North Dakota. This student is a future niece and was chosen for the convenience of meeting outside of school. I chose this student because based on the parent report, their daughter was on the edge of needing math intervention at their most recent conference before starting this intervention. Their teacher shared with the parent that the student has some skills that a third grader should have, but there were some small gaps that the student could use improvement on. The student assessed is in core math, and does not attend the intervention, and does not receive special education services. The AVMR Addition and Subtraction – Assessment Schedule was used to assess the students' strategies and abilities related to adding and subtracting (Kinsey et al. 2013, pp. 27 -30). The AVMR Structuring Numbers – Assessment Schedule was used to assess the students' ability of structuring numbers.

**AVMR Assessment Overview**

Assessment of math has been used as a summative collection of data after learning new content to gain student understanding. AVMR uses assessment to guide instruction instead. Teachers take their current understanding of students' knowledge on the content, and builds instruction that is within students' wheelhouse, promotes engagement and problem solving, and is challenging while building on the continuum of understanding and application. (Kinsey et al. 2013, p.6).

Students should be assessed one-on-one in a familiar classroom that is quiet, and use tables and chairs that are comfortable to assess in. Tables should be large to assure that all materials can comfortably fit. Videotaping is recommended when assessing to improve the accuracy of assessment, identify non-verbal strategies, and keep the assessment time short to keep the attention of the student. When assessing one-on-one, each assessment should last between eight to twelve minutes. While students are being assessed, the instructor should be sitting to the left of the student, not across from them. This way the assessor can observe students' use of their appendages to if used. If the teacher cannot observe non-verbal strategies, they may not get an accurate understanding of the students' knowledge of strategies. (Kinsey et al. 2013, pp. 6-7).

During the assessment, it is important to prompt the student how they solved their task, unless obvious. Asking the student how they solved allows the assessor to observe what strategies they are using to solve. Never ask the student if they used a specific strategy, this may lead to the student only using that specific strategy because they may think that is what the teacher wants to see used, instead of allowing the child to use a strategy of their choice. Instructors should not give verbal or non-verbal feedback when assessing, because this may influence the student causing a ”skew” in the assessment (Kinsey et al., 2013, p.7).

Once the assessment has been given, the instructor analyzes the assessment based on the constructs for each framework. They will take the information about what they know about the construct that the student is at, and develop instruction for that individual student. To monitor students' progress on instruction, teachers should review what skills students have developed during intervention and change instruction based on improvements. This should be done every six to eight weeks (Kinsey et al. 2013, pp. 9-10). The pre-assessment should take place at the beginning of the school year and post-assessment information should be collected near the end of the year. Kinsey et al. (2013) recommend that students should not be assessed at a minimum of three times a year (p. 10).

**AVMR 1 Assessment Learning Frameworks**

AVMR 1 assesses five learning frameworks; addition and subtraction arithmetical strategies, development of structuring numbers, development of forward / backward number word sequence, and numeral identification. Each learning framework is scored on a conceptual construct from zero to five. A zero meaning they are emerging at the skill, and a construct five is facile or at where they should be.  By the age of eight, students should be at a construct five in all five frameworks. Due to lack of time with of intervention, and previously assessing forward / backward number sequence and numeral identification when I was learning AVMR, addition, and subtraction arithmetical strategies and development of structuring numbers are the frameworks assessed for this study (Kinsey et al, 2013 pp.18, 32, 52-54 ).

The first framework being assessed is addition and subtraction arithmetical strategies. During the assessment, assessors are determining the students' ability to add and subtract, and the strategies used to solve those problems. The AVMR Addition and Subtraction – Assessment Schedule has four task groups that are assessed: Addition -Unscreened and Screened Collections, Subtraction – Screened Collections, Addition and Subtraction – Bare Numbers, and Relational thinking (Kinsey et al., 2013, pp. 25-26).

The addition and subtraction arithmetical strategies have connections to Common Core's mathematical practices. During the assessment, students are asked how they got their answers to a given question, and students can attend to precision and defend their answer by explaining how they got their answer. Students are expected to be able to use repeated reasoning and use a previous problem to answer another problem. For example, a student can make a connection between 21-17 and 21-4. Students are also assessed on their ability to decontextualize numbers in addition and subtraction problems into tens and ones and perform a calculation when breaking the problem down into their place value (Common Core State Standard Initiative, 2021).

Students' abilities to utilize addition and subtraction strategies are represented within conceptual constructs. Constructs zero through three are unitary strategies and constructs four and five are students can use composite strategies. Construct zero is where the student is an emerging counter, meaning that a student has no concept of number or cannot put number names to the number of objects. A construct one student can perceptually count things they can see or feel. A student who is a figurative counter is a construct two. This student would be considered a redundant counter because when given a concealed adding activity, the student will always start from one. For example, if a student is shown three counters, and they were to add 2 more, they would count the first three shown, then count the last two, counting them individually, to five. A learner at construct three is a student who can count on when given an addition problem or could down from when given a subtraction problem. A construct four is when a student can use a count-down-to strategy to solve a subtraction problem. For example, seventeen minus fourteen, the student would count down to fourteen from seventeen and be able to determine that the answer is three. At construct five, a student is facile with adding and subtracting. This means a student can use non-counting strategies such as adding or subtracting to ten, compensation, or jump addition (Kinsey et al, 2013, p.18).

The second framework assessed was the Development of Structuring. Structuring helps students develop skills that lead to more advanced counting strategies. The Structuring Number Assessment Schedule has five task groups that are assessed: spatial patterns, finger patterns, combinations and partitions of five and ten and to twenty (with materials), combining and partitioning numbers to five, ten, and twenty (without materials, and bare number problem (no materials (Kinsey et al., 2013, pp. 35-39). Structuring is one of the Common Core mathematical practices that students should have developed by the time they graduate (Common Core State Standard Initiative, 2021).

A student who is a construct zero is a student who relies on counting objects to give quantity, usually using their fingers. A construct one student can combine and partition numbers in a range of one to five without counting. A student who is a construct two uses five as a reference number when adding. This student knows their doubles from one to five and can represent numbers from six to ten on their fingers simultaneously. These students can also identify numbers one through ten on a number rack or other physical representation without counting. Construct three students can do what a construct two can, but without visuals. Construct four learners can double six through ten, use eleven to twenty as a reference number, and understand that teen numbers are ten-plus. Students at a construct four can also combine and partition numbers in a range of one to twenty using a visual like a bead rack. At construct five, students can do everything in a construct four, but without a supporting visual. From construct one to five, students can do everything mentioned related to structuring, all without counting. (Kinsey et al, 2013, p.32).

**AVMR Pre-Assessment**

The first assessment conducted was the Addition and Subtraction – Assessment Schedule. For task group one, she used the count on a strategy to solve both 6+3 and 9+5, but when asked to solve, she did not explain that is how she solved. For 6+3, she explained that 6+4 equals 10, so I take away one to get 9. Then for 9+5, she said I made the 9 and 10 and did 10+5 to get 15, then took one away to get 14. This shows that she knows how to use compensation, but relies heavily on counting with her fingers. When doing subtraction for task group two, she was able to use the count down from strategy, but counting by ones. When given bare number problems she was quick with doubles to solve 13+3, and understanding that the "1" is a ten. When given the bare number problem 11-8, she used the count down from strategy instead of a count down to strategy. Finally, for the relational thinking portion of the assessment, she did very well with this. She was given 4+12, and she asked if she could change it to 12+4, and was able to quickly add 4 and 2, to get 6, then add the ten back on. Then when given problem 15+3, she was able to use the same strategy to get 18, then she was asked to solve 18-3 given that problem, and she was able to answer very quickly 15 and made the comment before even asking that it had to be 15, and was able to explain her reasoning. Same when given 21-4 and 21-17, she was very quick to make the connection to solve.

Next was the Structuring Numbers – Assessment Schedule. To start this assessment, she was asked to identify dots on paper and represent given numbers on her fingers. She was able to do this fluently, without doing any kind of counting. For the next task group, she was assessed on combinations and partitions of 5 and 10 and to 20 with materials. The materials used was a bead rack that had two rows of ten beads, five of the beads were white and the 5 were red on each row. For the first part, she was only asked questions related to one row of beads. I would display a set of beads, and conceal the other part. The student could identify how many were displayed, and how many were missing. She was able to answer all of the questions without any trouble. In the next part, both rows were used. I would flash a set of the two rows, then conceal them quickly. I would then ask how many beads did she see on top, and how many on the bottom, then how many altogether. Out of the four sets I flashed, she was able to identify all of the rows and identify their combinations without counting, except for the second and fourth questions. She was able to identify the numbers flashed to her, but when she, but when she was asked the total, she counted on for both problems. The next part of the assessment was combining and partitioning to 5, 10, and 20 without materials. In the first part, she was given a number and needed to give the other number to make 10, which was a quick answer for her. She was also asked two combinations to make 9 and was able to identify both combinations quickly. In the next set, she was given the number story "I have *blank*, I wish I had *blank*". The first problem was 10/18, and 8 was a quick answer. For the next two, 7/20 and 9/16, she counted on both problems. For the last part of the assessment, I would ask "what is" and would place down a bare number problem, and she was not able to use materials. The first three problems, 5+4, 3+3, 9-6, were quick answers, but when given 8-4, she used the count down from strategy. For the next set of problems, 9+9, and 10+6 she was able to answer very quickly because she has her doubles down, and adding from 10 comes easy. For the next two problems, 13-5 and 20-6, she counted down for both problems.

**Determining Construct**

Taking the information from the Addition and Subtraction – Assessment Schedule, it is clear that the student relies heavily on her unitary strategies like counting on her fingers to solve addition and subtraction problems. On the other hand, even though she used her fingers to count on, she was also able to identify composition skills to solve problems like 6+3 and 9+5. She also showed count down from strategies when doing subtracting, but was not able to execute the count down to strategies. This would place her at a construct three. She was also able to show skills of a construct five when she was able to use compensation and commutativity when conducting addition problems. She also solved problems that involved identifying subtraction as an inverse of addition when given 15+3 and 18-3. Even though the student was able to show skills of a construct five, I would place her at a construct three because she was able to count on and count down from but counted by ones.

Based on what was gathered from the Structuring Numbers – Assessment Schedule, it was observed spatial and finger patterns were not a concern, meaning she was higher than a construct one. When looking at the task group where the student had to identify the beads showing and how many were concealed on a ten-bead bead rack, she was able to do this fluently and without counting the materials. This would place her higher than a construct two. She also did well identifying what was on top, bottom, and all together, but with counting when it was not a double, or the first number being a ten which means she cannot be a construct four. When looking at combinations and partitioning without materials, the student did well with identifying the missing number to make ten which makes her a clear construct three. When assessing to twenty without materials, using the number story "I have *blank*, I wish I had *blank*", she did well with the 10/18, but when given 7/20 and 9/16, she struggled and resulted to counting, making it clear she was not a construct 5 yet. Based on this information from the assessment, the student was identified as a construct three, because she did well with being able to combine and partition numbers between one and 10 without materials. It could be argued that she is close to a construct four because she knew her doubles six through 10 and could do combinations in numbers ranging from one to twenty, but the first number had to be ten or had to be doubles.

## Intervention

Based on what was gathered from the Addition and Subtraction – Assessment Schedule and the Structuring Number – Assessment Schedule, the student relies heave on using her fingers when adding and subtracting and does not have skills to add and subtract across ten. She also struggled to use the count down strategy when subtracting numbers close to each other. Based on this information gathered, these are the skills that require intervention.

To develop the count down to strategy, I used an intervention from Wright et al. (2015) called *Comparative Subtraction Involving Two Screened Collections* (pp. 99-100). The interventionist would conceal some red counters, then conceal a lesser amount of blue counters, the ask “if you were to cover the red counters with blue counters, how many red counters would be uncovered?”. In this intervention, the goal is to encourage the student to either use the count up to or count down to strategies.

To improve subtraction across a ten by using structuring to ten, I use the intervention *Subtraction Using Doubles, Fives, and Tens – Subtrahend and Difference Less than Eleven* (Wright et al., 2015, p.122). In this intervention, using the top and bottom of a bead rack, the student would identify how many beads they would see when flashed, they would be given a number to subtract, using the bead rack to solve. The goal of this intervention is to get the student to subtract to ten, then subtract the remaining amount to develop better subtraction strategies. When solving, the student should be describing their steps while solving using the bead rack, eventually being able to solve bare number problems, but continuing this skill. Also from this strategy, missing add-ins will be worked on. The student would determine how many beads they see and ask how many more to get a new number. The goal would be to add to 10, then add the remainder, all while explaining their steps.

## Results

### Intervention

Kinsey et al. (2013) and The Minnesota Department of Education (2021) both recommend at least six to eight weeks, three days a week for intervention. Due to the business of a family of six, kids being involved in extracurricular activities, and illness, I was only able to meet with my student for five weeks and an average of two days a week.

The first intervention implemented was the Comparative Subtraction Involving Two Screened Collections (Wright et al., 2015, pp. 99-100). The student had a hard time visualizing this at the beginning of the intervention, so we started with a few that were not concealed. This way she understand what was being asked of her. Then we started concealing them, and she very quickly developed the count up to strategy. I then modeled for my student the count down to strategy when using subtraction, and she was able to understand and began to utilize bare number subtraction problems. This took only one week of intervention sessions to develop this skill.

For the remaining four weeks of intervention, we used the bead rack and Subtraction using Doubles, Fives, and Tens – Subtrahend and Difference Less than Eleven intervention (Wright et al, 2015, p. 122). The goal of this intervention was to teach the student a strategy to add and subtract across tens without unitary strategies like counting. At the beginning of this intervention, when the student was given a problem, she would result to counting each bead that she was taking away. I then modeled how to subtract to ten, then subtract the remaining. We also worked on adding across ten using the bead rack. When solving the adding and subtracting problems with the bead rack, I asked the student to verbalize what she was doing when moving the beads. As she got more fluent at solving the bead rack, I began to implement bare number problems where she would have to add and subtract across ten. She continued to verbalize adding and subtracting to ten, then adding or subtracting the remainder. We then worked on missing add-ins, still using the same strategies. She continued to be fluent with using the structuring strategy on bare numbers. On the last day of intervention before assessing again, challenged her to continue to use her structuring skill for adding two-digit numbers across ten. At first, it took some time, but as we did more problems, she continued to improve. She would add or subtract to the ten places, subtract the one's place to the nearest ten, then subtract the remainder from the one's place and solve. This is when I knew she had developed better structuring skills and was time to reassess.

**AVMR Post Assessment**

Before addressing how the students did on the post-test, I do want to add some things that happened that could have caused a skew to the assessment. First off, the student notified me that she was both very hungry and tired. This may affect the students' ability to follow instructions or focus. I also started the assessment by stating "remember the strategy that we have been working on". This may have led the student to think that this is the only strategy I want her to use.

For the Addition and Subtraction – Assessment Schedule, the student did make improvements in the fact that she did use the strategy she learned, but she also had good strategies to solve in the pre-assessment. For example, when given the problem 9+5, on the pretest, she used compensation and changed the 9 to a 10, added the 5, then subtracted one. This time she added one to make ten, then added four more the get 14.  For subtraction of screened collections, she was able to subtract 4 from 6 in 16-4, and use count up to strategy for missing add – in. She used the same structuring to ten strategies to solve 8+4. For 13+3, she used her previous strategy of doubles in the one's place to get 16. For problem 11-8, she subtracted one to get ten, then subtracted seven more to get 3, instead of using the count down to strategy. For the questions when she had to solve the bare number 15+3, she added the 5 and 3 to get 8, then added the ten back on. Then when asked to use that answer to solve 18-3, she was able to quickly describe the connection between the two problems. For 21-4, she used the strategy we worked on to take away 1, then three more. Then when asked to use that answer to solve 21-17, she was able to make the connection that if she added 4 to 17, she would get 21.

Based on what was observed during the post-test, it could be determined that the student is a construct five. She can use a variety of addition and subtraction skills such as compensation, adding and subtracting to ten, and has the awareness that there is a ten in the teen numbers. The only thing that could keep the student from being a construct five is that she still does not have the count down to strategy, which is a construct four strategy.

After reassessing the Structuring Numbers – Assessment Schedule, there was no change in her ability of spatial and finger patterns and identifying both. This means that she is higher than a construct one. When assessing combinations and partitions of 10, there were no changes in her ability. She was able to identify how many beads she saw, and how many were missing with the knowledge that there are ten total beads. This assures she is a construct two. Same with combining and partitioning numbers to 10 without materials. She was able to identify a number that goes with a given number to make ten without showing any kind of counting. There was an improvement with the combination and partitioning to 20 with materials. She was able to identify all four flashed sets and able to solve their combinations without counting. On the previous assessment, she had to count on the problems 7+6 and 5+2, which means she has improved to at least a construct four. When combining and partitioning to 20 without materials, she continued to show improvement. For the part that had the number story, "I have *blank,* I wish I had *blank"*. Before she had to count on to solve 7/20. This time she added three to get ten, the added ten more to get twenty, giving her 20. Same with 9/16, she used the count on strategy, but this time she knew immediately because she said "9 is one less than 10, so I need to add one to six 6, so the answer should be 7. Finally, for the bare number problems to 10, she was able to quickly answer 5+4, 3+3, 9-6, and 8-4. For the bare numbers problem to 20, she quickly answered 9+9 and 10+6. For 13-5, she anchored to ten, the took away two more to get 8. And was able to quickly answer 20-6.

Based on this information of the post-test of the Structuring Numbers – Assessment Schedule, the students had made some great improvements on structuring to 10. The biggest improvement was the combining and partitioning number to 20 with and without materials. She did not use any counting strategies and was able to answer quickly. Since she was able to combine and partition to 20 without materials, this would put her at a construct five.

## Discussion

Considering the improvements on the pre and post-assessment, Add+ Vantage Math Recovery does affect students who may be lacking in skills in the learning frameworks that AVMR addresses. Wright et al. (2015) wrote an entire book of interventions related to the variety of students' needs that could be identified from the assessment schedules in AVMR 1 is a useful resource to support interventionists determine activities that can be done with students. During the intervention, the student seemed to enjoy using the bead rack as a manipulative to help her answer her questions. There were times where she made comments like “can we go back to the bead rack, that is much easier” when answering bare number problems. But after a while, she was able to not rely on the bead rack and was able to answer bare number problems like she had the bead rack right in front of her. It was enjoyable to see how much the student grew throughout the short intervention. Going from using the bead rack and verbalizing her steps, to being able to read a number sentence out loud, and solve the problem the same way. Verbalizing that she takes away a certain amount to get to 10, the, add or subtract the remainder. Then to apply these same skills to two-digit addition and subtraction where the bead rack would not help was an awesome improvement as well. She also expressed that she was sad after the post-assessment. She was making such great improvements that she wanted to continue working on her skills.

**How to Improve Study**

Overall, I do believe this study did prove that AVMR is an intervention that is beneficial to students with a specific learning disability or just struggle with math overall, but for this study, I do believe that some things could have been improved. First, I was treating this as a tier two intervention according to Minnesota's Department of Education definition of MTSS. For a tier two intervention, MDE (2021) says that intervention should go for ten to fifteen weeks with three to four thirty-minute sessions a week (para. 4). My intervention took place over five weeks with two days of thirty-minute sessions a week. The student I chose for this intervention is part of a split family, with an abnormal custody schedule. This made it difficult to have a consistent schedule with the student and meet the proper amount of meeting times to have an even more meaningful intervention.

Another way to improve this assessment would be having a larger gap of the pre and post-assessment. Kinsey et al. (2013) suggest that the pre-assessment be administered at the beginning of the year, and the post-assessment be given at the end of the year. Due to the time of this project, the time between the pre and post-assessment was a total of six weeks (p.10)

A final way to improve this study would be having a control student. This way I could have compared two students that are the same age, one who attended core classes and received the AVMR intervention, and one student who continued to attend core classes without any kind of intervention. I then could have compared the intervention student's response to intervention to a student who did not receive any kind of intervention. This could improve the validity of the effects of AVMR and how its intervention improves students' mathematical ability.

After being taught AVMR in the summer of 2021, it was nice to implement this intervention and see its effects on a student who does have some areas of struggle in mathematics. In the future, I hope to become a math interventionist and hopefully be able to use AVMR to its full effect to support a variety of students, both with specific learning disabilities in math, and those who are just in need of intervention.

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