TECHNICAL REPORT

A FORMAL EVALUATION OF enCORE ELEMENTARY 2023

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TEACHTOWN®

TEACHTOWN STUDIED THE EFFECTIVENESS OF ENCORE ELEMENTARY in a formal research study during the 2022-2023 school year. The results show what we already knew – enCORE *works!*

The teacher in the study successfully delivered **grade-aligned academic content** and **individualized instruction** to meet the **diverse learning needs** of *all* students in a K-5 self-contained classroom. The study took place over a 6-month period in which the teacher implemented enCORE's classroom-based lessons and technology-facilitated lessons with 84% fidelity *(typical research standard is 80% or higher)*. The students' mastery and growth results were phenomenal!

The students **mastered** a broad range of new ELA and Math skills (evidenced by rigorous, clinical research standard-assessments), **retained** those skills after instruction ended (evidenced by post-test scores), and **generalized** their learning several weeks after instruction ended (evidenced by demonstration of skills with novel content, materials or in novel settings).

The following report provides an in-depth look into the study details. *Let's dive in!*

EVALUATION PURPOSE

TeachTown in collaboration with a school district in the mid-Atlantic region of the United States conducted an evaluation on the impact of the *enCORE Elementary* program in a K-5 self-contained classroom during the winter and spring of the 2022-23 school year. The purpose of the evaluation was to determine the impact of *enCORE Elementary* on student learning and to document feasibility of implementing the comprehensive curriculum in a public school classroom representative of the classrooms in which *enCORE Elementary* is used.

The study addressed three main questions:

1. What are the effects of *enCORE Elementary* on students' demonstration of targeted ELA and mathematics skills in terms of acquisition, maintenance and generalization of targeted skills?
2. Can a teacher implement *enCORE Elementary*, a comprehensive approach to teaching grade-aligned ELA and Math content, to appropriately meet the learning needs of all students in a self-contained classroom for students with moderate to severe disabilities?
3. How well is *enCORE Elementary* accepted and embraced by the teacher, her students, and their parents or caregivers?

Students were evaluated on targeted ELA and mathematics skills before and after receiving instruction in *enCORE*. This design allowed TeachTown to evaluate improvements from pre-test to post-test. Implementation fidelity data were collected weekly by the teacher through two self-monitoring implementation checklists.

CONTENTS

SETTING

The setting was a combined K-5 self-contained classroom for students with moderate-to-severe disabilities at an elementary school in a suburban school district in the mid-Atlantic region of the United States during literacy and math instruction. The district served nearly 11,000 students and consisted of 12 elementary schools, four middle schools, three K-8 schools, and three high schools. The classroom also served some students with disabilities who were not making progress in a general education setting. The background information for the elementary school and the classroom are presented in Tables 1 and 2, respectively.

Table 1. Background information for the elementary school where the study took place.

Grades	PreK-5
Enrollment	160
% Free or reduced-price lunch	100
% Black	18
% White	56
% Hispanic	18
% Asian/Pacific Islander	1
% Two or more races	7

Table 2. Background information for the 11 students enrolled in the classroom included in the study.

Subgroup	Number of Students
Kindergarten	2
Grade 1	1
Grade 2	2
Grade 3	1
Grade 4	2
Grade 5	3
Free or reduced-price lunch	1
Black	1
White	5
Hispanic/Latino/a	2
Asian/Pacific Islander	0
Two or more races	3
ELL	0
Display behavior difficulties	7
Display severe and persistent behaviors	2
Moderate to Severe/Profound Autism	5
Developmental Delay with suspected ADHD (with a diagnosis of Moderate Autism)	1
Multiple Disabilities	2
ID-Moderate (Down Syndrome)	1
Other Health Impaired and Vision Impaired	1
ID-Mild with Other Health Impaired	1

PARTICIPANTS

STUDENTS

Participants included two elementary school students with developmental disabilities who met the inclusion criteria for this study. The inclusion criteria included:

(a) receives special education services under the state's category for moderate to severe disabilities

(b) no prior exposure to *enCORE* instruction

(c) able to communicate symbolically through words or symbols, and

(d) able to receptively select a known stimulus from an array of three or more response options within 10 seconds as evidence of understanding basic directions.

The criteria (c) and (d) were included to ensure the study assessments could be used to reliably measure performance levels of the targeted skills. There was one kindergarten student and one first grade student who met the inclusion criteria and participated in the evaluation.

DIEGO (pseudonyms used throughout) was five years old when the study began, a male enrolled in kindergarten and Hispanic. He was classified as having Severe Autism. Based on his most recent evaluation, his mental age was 3 years 2 months and his IQ was below 55 (Transdisciplinary Play-Based Assessment, Second Edition). He could not read any letters or words. When he entered kindergarten, he was considered minimally verbal and showed some disruptive behaviors. He did not use language to communicate basic wants or needs or reliably respond to questions, although he repeated words and labeled items within certain preferred categories (e.g, animals). He loved animals and letters. Visual objects were used as supports for communication; his preferred method for responding was pointing. He was included in general education classes for specials, but his academic lessons took place in the self-contained classroom. He received speech and language services. Over the course of the school year, the teacher observed an improvement in Diego's social communication behaviors and reported that she thought Moderate Autism instead of Severe Autism was a more accurate classification.

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HENRY was six years old when the study began, a male enrolled in first grade and White. He was classified as having Developmental Delay and after his special education evaluation he had received a diagnosis of Moderate Autism. His teacher suspected he had ADHD due to displays of hyperactive behaviors and trouble focusing and sustaining attention. Based on his most recent evaluation, his mental age was 3 years 2 months and his IQ was below 56 (Battelle Developmental Inventory-Second Edition). He could not read any letters or words. He used language to communicate wants and needs and responded verbally to questions, although he had some limits on expressive language. He was included in general education classes for specials, but his academic lessons took place in the self-contained classroom. He received speech and language services.

One kindergarten student, **ANI**, met all of the inclusion criteria except for (c) and (d): she was not able to communicate symbolically through words or symbols, nor was she able to receptively select a known stimulus from an array of three or more response options consistently. The teacher determined that participating in *enCORE* and working on prerequisite skills (such as selecting a known response from an array of response options) would educationally benefit this student. She was observed to evaluate the effects of *enCORE Elementary* because her cognitive and behavioral profile is representative of many of the students that are enrolled in classrooms using *enCORE Elementary*. Her results, however, are reported separately because her data are considered less reliable due to her inability to reliably select a known stimulus from an array of three or four response options within five seconds.

Ani was 5-years old when the study began, female, and identified as belonging to two or more races. She was classified as having Severe Autism. Based on records from an evaluation completed when she was 2 years 10 months, she scored in the 5th percentile on the Developmental Assessment of Young Children-Second Edition (DAYC-2). She could not read any letters or words prior to receiving *enCORE* instruction. She was considered nonverbal: she did not use language to communicate basic wants or needs or respond to questions using words and did not reliably respond to questions using symbols. Visual objects were used as supports for communication; her method for responding was pointing. The teacher reported that she displayed frequent and severe disruptive behaviors and had trouble focusing, and described her as "hard to reach." She was included in general education classes for specials, but she did not engage with other students. Her academic lessons took place in the self-contained classroom. She received speech and language, occupational therapy and Applied Behavior Analysis services.

TEACHER

One elementary school special education teacher of a self-contained classroom participated in the study. The teacher had a bachelor's degree in special education and five years of experience as a self-contained classroom teacher at the elementary level and four years of experience as a special education classroom teacher at the middle school level. The teacher had one year of experience teaching select components of *enCORE* (i.e., the scripted lesson plans) prior to the study period.

INSTRUCTIONAL ASSISTANTS

Three instructional assistants provided instructional support in the classroom such as monitoring student-led technology sessions. They did not deliver *enCORE* lesson plans, teacher-led technology-lessons or collect study data. They had varying levels of education and experience assisting in separate setting classrooms. One had an associate degree in early childhood education, one with a bachelor's degree in psychology, and one with several college courses in early childhood education. Years of experience assisting in separate setting classrooms was four years for two instructional assistants and three years for one instructional assistant. One instructional assistant had one year of experience with *enCORE* prior to the study.

PROCEDURES

enCORE ELEMENTARY MATERIALS

Materials were organized into themed units based on two pieces of literature, one fiction and one non-fiction book, adapted and differentiated across three levels of support. All content in each unit related to the theme of the unit. For each piece of literature, scripted lessons and accompanying student worksheets for ELA and math were provided. Teacher-led lessons using print were integrated with 1) teacher-led lessons using technology, and 2) technology-based lessons for students to work independently, to reinforce skills and content taught in the print lesson plans. Each unit included 10 scripted lessons for ELA and 8 scripted lesson plans for math. Each lesson targeted skills that align to elementary grade level standards and used evidence-based practices for teaching those skills.

The teacher delivered Units 1 - 3 ELA to Diego, Henry and Ani; Units 1 - 3 math to Diego and Ani; and Units 8 – 10 math to Henry.

enCORE print, teacher-led technology lessons and independent student-led technology lessons provide differentiated content and instruction across three levels of support:

Level 1: Adapted to meet the needs of students with the most significant learning challenges who require the most substantial support.

Level 2: Adapted to meet the needs of students with complex learning challenges who require a moderate level of support.

Level 3: Adapted to meet the needs of students with complex learning challenges who require some modifications and support.

Instructional tasks and response options were differentiated for students at each of the levels of support described above. For example, for comprehension, students at Level 1 and Level 2 were provided with response options that were words with photo or illustration support. The WH-questions for Level 1 students were the simplest syntactically and the responses were based on information directly presented in the text. The questions for Level 2 were syntactically more complex than the Level 1 questions, and responses to most questions required drawing inferences because the answer was not directly presented in the text. Students at Level 3 were provided with syntactically the most complex questions and answering them required drawing inferences. The response options to Level 3 questions included words only.

Student materials consisted of adapted books and student worksheets. Teacher materials included scripted lesson plans (five ELA and four math lesson plans related to the adapted fiction book, and five ELA and four math lesson plans related to the adapted non-fiction book) provided in a Teacher Guide and online, adapted books, and cards for vocabulary, sight words, number and quantity, measurement concepts, shapes, and coin values. Teacher materials also included graphic organizers for ELA and math, counting mats and counters, place value charts, and the manipulative kit. The manipulative kit included a magnetic whiteboard, letter magnets, and manipulatives for math including Unilink Cubes, a wooden clock, a toy money set, and a shapes and attributes block set.

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enCORE
ELEMENTARY INSTRUCTION

enCORE Elementary instruction was provided in small group rotations with two groups of students five days a week. Each student was assigned to one of the three levels of support (i.e., Level 1, Level 2 or Level 3). Each level corresponded to a specific response option and level of instruction, each with differing levels of support, to be used during instruction.

The first group consisted of five students in kindergarten through grade 2 and included the three study participants. The teacher decided to begin these students at Unit 1 and assigned them to Level 1 for ELA and math.

The second group consisted of six students in grades 3 through 5 who began the school year receiving instruction in Unit 8. The teacher assigned four students in this group to Level 1, one student to Level 2, and one student to Level 3.

Based on Henry's performance on the math pre-test and the Unit 1 math probes, the teacher decided to move him to the grades 3-5 instructional group for math instruction in December. She assigned him to Level 2 or 3, depending on the complexity of the skill area.

Instruction in the scripted lessons was provided daily by the teacher in a 30-minute block for each ELA and math. An instructional assistant provided support to differentiate scripted lesson instruction across multiple levels. Instruction in three units of *enCORE* ended the last week of March, one week prior to spring break.

Teacher-led and student-led technology lessons were each provided in 15 - 30-minute sessions for all content areas (ELA, math, social studies and science) twice a week. Teacher-led technology lessons were delivered by the teacher and student-led technology sessions were monitored by an instructional assistant. In total, ELA and math instruction were each provided for 30 minutes three days a week, and 60 to 90 minutes two days a week. Students also received *enCORE* science and social studies instruction daily each in a 30-minute block.

TEACHER TRAINING

At the beginning of the study, the teacher had one year of experience using select components of the *enCORE* curriculum. During the previous school year, she had delivered the lesson plans and the student-led technology lessons included in enCORE, but not the teacher-led technology component. The only training she had received prior to the study was viewing online tutorial videos. In October 2022, just prior to the instructional period, the teacher received a 6-hour training in *enCORE* by a national *enCORE* trainer, and two follow-up coaching sessions, one in December and one in January. These sessions focused mainly on behavior management and implementing the technology-based lessons.

MEASURES

The outcome measure was a pre-test and a post-test that was developed for Units 1-3 ELA and math lessons and Units 8 -10 math lessons. The pre- and post-test measures were based on the scripted lessons and target skills for elementary ELA and math. The pre- and post-test contained a similar format as the daily lessons the teacher delivered, except for two main differences: 1) the pre/post-test used an array of four response options for most receptive identification tasks described below, whereas the scripted lessons used an array of two or three response choices; and 2) the distractors used in the pre/post-test represented common errors whereas the distractors used in the scripted lessons did not represent common errors; they were the other targets in the task (e.g., for sight word identification, the distractors were the other sight words being taught in the lesson).

A third assessment to be given at a follow-up point several weeks after the post-test was designed to assess generalization of targeted ELA and math skills. Generalization was only evaluated for skills for which a pre-test-post-test increase was observed. For almost all skills, generalization to novel content or materials was evaluated. The only exception was for reciting numbers in a sequence and money concepts and skills. For these skills, generalization to a novel setting was assessed because novel content or novel materials was not appropriate or feasible. The pre- and post-test measures as well as the follow-up generalization measures for ELA and math are shown in Tables 3 and 4, respectively.

Table 3. Pre- and post-test measure and follow-up generalization measure for each ELA skill area.

ELA Skill Area	Pre- and Post-test Measure	Follow-Up Generalization Measure
Vocabulary	Receptively identify the target concept from an array of 4 images. One distractor was an image of a noun in the same concept category, one distractor was an image of a noun that was the same color as the target image, and one distractor was an image of another target vocabulary concept.	Perform the task with novel images.
Sight Word Identification	Receptively identify the target word from an array of 4 words printed on cards. One distractor had the same first letter, middle letter or final letter as the target word, one distractor was another target word from the same storybook, and one distractor was another non-target word from the same storybook. There were 18 targeted sight words.	Receptively identify the target word presented in a four-word printed sentence.
Concept of Print	Identify targeted concepts of print when given a familiar book. The targets were front cover, title, author, title page, illustration, turn page, and a word.	Identify the targeted concept of print when given an unfamiliar book.

ELA Skill Area	Pre- and Post-test Measure	Follow-Up Generalization Measure
Comprehension	Respond to seven comprehension questions about an unfamiliar book that was read aloud. The question types included main character, literal recall, inferential, setting, and problem. Response options were provided in the same format that the student encountered in the curriculum (e.g., words with illustration support.)	Answer comprehension questions about a unfamiliar fiction book read aloud.
Phonological Awareness	There were four phonological awareness tasks. Each task consisted of three to five trials. 1. Listen to a pair of sounds or words and identify the sounds/ words as the same or different sounds for five items. 2. Listen to a pair of words and identify whether the words rhyme for five items. 3. Listen to one or two-syllable words and name or pound out the syllables for three items. 4. Listen to a word pair and identify whether they have the same rime for three items.	Perform the tasks with novel sounds and words.
Letter Identification and Phoneme-grapheme Correspondence	Uppercase and lowercase letter identification, and letter-sound identification for four consonants and two vowels using magnet letters included in the *enCORE* manipulative kit. For each targeted letter, the student was provided four verbal cues: a) receptively identify the uppercase letter, b) receptively identify the lowercase letter, c) produce the letter sound (for verbal students only), and d) touch the letter that makes the sound produced orally by the teacher. All distractors were visually similar letters and were other vowels for vowel targets and other consonants for consonant targets.	Identify the targeted uppercase and lowercase letter from an array of 4 letters using novel materials (the target letter printed on a card).
Phonemic Decoding	Sound out 10 nonsense consonant-vowel-consonant (CVC) words, that were targeted during instruction, spelled using the letter magnets included in the *enCORE* manipulative kit.	Sound out the 10 targeted nonsense words written on a whiteboard. Sound out five novel CVC nonsense words formed using letters targeted in Units 1-3, written on a whiteboard.
Language Concept Sorting	Sort images of exemplars into concept categories targeted during instruction. For each sort task, a student was asked to sort eight exemplars into two categories. The target categories depended on the level of support assigned during instruction, and included food/not food, vegetable/not vegetable, vegetable/dairy, body part/not body part, animal/not animal, and farm animal/ not farm animal.	Sort novel images into targeted concept categories.
Writing	Write the letters targeted in letter identification (uppercase letter for Level 1 students and upper and lowercase letters for Level 2 and 3 students). For each targeted letter, a student received one point for scribbling and two points for correctly writing the letter.	Not applicable: Henry mastered writing letters at pre-test, and Diego and Ani showed no pre -to post-test improvement: they scribbled at both pre- and post-test.

Table 4. Pre- and post-test measure and the follow-up generalization measure for each math skill area.

Math	Pre- and Post-test Measure	Follow-Up Generalization Measure
Recite Numbers in a Sequence	Count to a given number. The number was 15 for the Units 1–3 pre- and post-test and 70 for the Units 8–10 pre- and post-test.	Count to a given number in a novel setting.
Number identification	Receptively identify numbers in an array of 4 numbers using the same materials used in the curriculum (the number magnets provided with the curriculum). The numbers targeted for the Level 1 student, Ani, were 1-5. Diego and Henry had demonstrated mastery of receptive and expressive number identification at pre-test.	Receptively identify numbers in an array of 4 numbers using novel materials (the numbers printed on cards).
Count with One-to-one Correspondence	**Units 1-3** Out of a given set of Unilink Cubes, count the target number of Unilink Cubes. The size of the set given depended on the level of the student.	**Units 1-3** Out of a given set of novel items, count the target number of items. The size of the set given depended on the level of the student.
Addition and Subtraction Using Manipulatives	**Units 1-3** Listen to a word problem from a familiar story, combine sets up to five using manipulatives, and tell or show how many in all for five trials. **Units 8-10** 1. Listen to a word problem representing an addition (up to 10) problem from a familiar story, write the corresponding number sentence and solve the problem using manipulatives for five trials. 2. Listen to a word problem representing an addition or subtraction problem (up to 10) from a familiar story, decide whether the problem is addition or subtraction, write the corresponding number sentence and solve the problem for five trials.	**Units 1-3** Listen to a novel word problem and combine novel sets up to 5 using novel manipulatives, and tell or show how many in all for five trials. **Units 8-10** Listen to a novel word problem, write the number sentence and solve the addition (up to 10) problem using novel manipulatives for 5 trials. Listen to a novel word problem, decide whether the problem is addition or subtraction, write the number sentence and solve the problem for 5 trials.
Place Value and Quantity Concepts less than and more than	**Units 8-10** View two numbers in a 100s chart and decide which number is bigger for five trials. Identify numbers in the tens and ones place in a two-digit number for five trials. Draw two given quantities of circles, each in a five frame, compare the quantities and identify the five frame that has less for five trials. Count out a quantity of counters up to 10 on a five frame and then count out the same quantity on a ten frame for five trials.	**Units 8-10** Perform the task using novel numbers or quantities.

Math	Pre- and Post-test Measure	Follow-Up Generalization Measure
Measurement Concepts	**Units 1-3** Using the cards included in enCORE, identify an image of a container that is empty, full, and has some in it for nine trials, three trials per concept across three different containers. Level 1 targets include empty and full; Level 2 targets include empty, full and some. **Units 8-10** Using the Pan Balance included in the manipulative kit of enCORE, place two familiar objects on the Pan Balance and identify the light object, the heavy object or both objects, if the objects' weight is equal for three trials. After two groups of different quantities of familiar objects are placed on different sides of the Pan Balance, identify whether the weights are equal or different, and then move the correct number of markers to the other wide to make the groups equal in weight.	**Units 1-3** Perform the task using a novel real-life container. **Units 8-10** Perform both tasks with novel objects.
Time	**Units 8-10** Use the toy wooden clock included in the manipulative kit of *enCORE* to move the hands of the clock to the correct places to make time to the half hour for five trials.	**Units 8-10** Perform the task using a novel toy clock.
Money Concepts	**Units 1-3** Using the Money Set included in the manipulative kit of enCORE: Level 1: sort exemplars into money and not money categories, and sort using match-to-sample coins and dollar bills into two categories: coins and dollar bills. Level 2: expressively identify a coin and a dollar bill, and sort coins and dollar bills into two categories: coins and dollar bills. **Units 8-10** Using the Money Set included in enCORE: a) identify the dollar bill worth one dollar and five dollars from an array of three dollar bills and one coin for five trials, b) identify the coin from an array of four coins worth a given amount up to 25 cents. and c) make 5 cents, 10 cents and 25 cents from a pile of mixed coins and then show a different way to make 5 cents, 10 cents and 25 cents.	**Units 1-3** and **Units 8-10** Use real money to perform all money tasks.
Shape and Location Concepts	**Units 1-3** Level 1: Receptively identify an image of a circle, a square and a triangle from an array of four shapes in nine trials, three per shape. Level 2: In addition to the receptive identification task described above, expressively identify a circle, a square, and a triangle in three trials, one per shape. **Units 8-10** Using the Shapes and Attributes Block Set and 3D Shapes included in the manipulative kit of enCORE, a) identify whether a pair of shapes are the same or different for five trials, and b) expressively identify four three-dimensional shapes.	**Units 1-3** Receptively identify unfamiliar images of circle-shaped, square-shaped and triangle-shaped real-life objects (e.g., a donut for a circle) in nine trials. **Units 8-10** Perform both tasks using real-life objects shaped like the targeted shape (e.g., a globe for a sphere, a die for a cube).

ASSESSMENT SCHEDULE AND PROCEDURE

The special education teacher administered the pre-test measure for Units 1-3 ELA and math in October prior to the instructional period. Henry scored 94 percent on the math pre-test. Therefore, a pre-test in math for Units 8-10 (the units the grades 3-5 group planned to cover between November and April) was developed. The teacher administered the Units 8-10 math pre-test to Henry in November.

The post-test was administered after completion of the 30 ELA lessons in Units 1-3, 24 math lessons in Units 1-3, and 24 lessons in Units 8-10, the week prior to spring break. The pre- and post-test were given in a one-to-one format with the materials for each item (e.g., vocabulary cards, sight word cards, adapted fiction book from Unit 1). After spring break, the teacher reviewed selected ELA and math concepts and skills from the content covered during the study period.

For ELA and math, generalization to unfamiliar content or materials were assessed in the follow-up assessment. When unfamiliar content or materials were not feasible, specifically for reciting numbers in a sequence and the money tasks, an unfamiliar setting was used. The follow-up generalization measure was given three weeks following the post-test for ELA and four weeks following the post-test for math.

The teacher followed explicit directions for each item and gave a score of plus (+) for independent correct responses or minus (–) when an error or no response occurred. In the area of writing, possible scores ranged from zero to two (0 = no response, 1 = scribbles, 2 = writes the correct response). In the area of Language Sorting, possible scores ranged from zero to eight (0 = no response and 1 point is given for each item sorted correctly). For multi-step math skills, possible scores ranged from zero to three or zero to four, depending on the task. Percentage of correct responses was calculated for each skill area and the content domain overall. Mastery criterion was 80 percent correct.

IMPLEMENTATION FIDELITY

Implementation fidelity was measured in two ways:

1. the percentage of steps of a lesson plan implemented, and
2. the percentage of lesson segments of a modified version of the six-week implementation guideline implemented.

The six-week implementation guide was modified to accommodate the classroom schedule: the number of lesson components for ELA was reduced and the teacher-led technology lessons were reduced to two 15–30-minute sessions a week.

The special education teacher completed three self-monitoring checklists:

1. an implementation fidelity checklist of the lesson steps weekly,
2. an implementation guideline checklist of the lesson segments weekly, and
3. a fidelity checklist of the data collection procedure for the pre-test and post-test.

A plus (+) was given for a step implemented and a minus (–) was given if the step was not performed. Implementation fidelity was determined by dividing the number of steps performed by the number of steps expected, multiplied by 100. Mean implementation fidelity for lesson steps across the study period was 91%, mean implementation guideline fidelity was 77% and mean procedural fidelity was 100% for the pre-test and 100% for the post-test.

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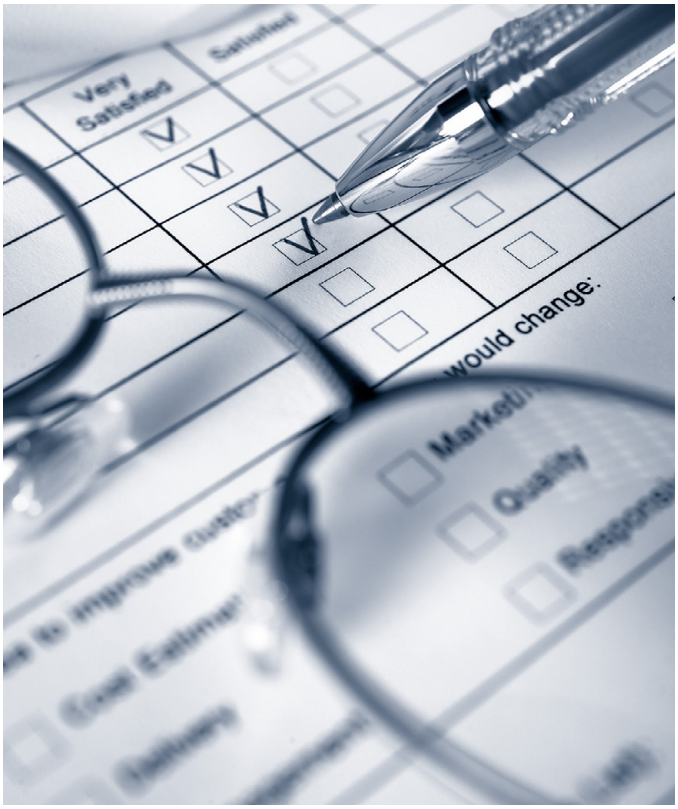
SOCIAL VALIDITY MEASURES

In order to assess acceptance and satisfaction with *enCORE Elementary*, a teacher survey, a parent survey and a student survey were administered at the end of the study period to the special education teacher, the study students, and their parents, respectively. The teacher, parent and student surveys used a four-point Likert scale; the student survey used an icon-based Likert scale (i.e., icons representing a very happy face, somewhat happy face, somewhat sad face, and very sad face). The teacher survey assessed features in the following areas: lesson plans, adapted books, online dashboard, teacher-led and student-led technology-based lessons, skills taught in enCORE, and the effects of *enCORE*. The parent survey assessed two areas: the skills taught in *enCORE* and the effects of *enCORE*. The student survey assessed the extent to which students like the materials and activities in *enCORE* and the extent to which students learned new ELA and math skills.



RESULTS

The percentage correct on pre-test and post-test measures are presented for each student and content domain. The two students, Diego and Henry, who met the study inclusion criteria, were observed to evaluate the effectiveness of *enCORE Elementary* for students with moderate to severe disabilities.

One student, Ani, did not meet two of the inclusion criteria put in place to ensure reliable measurement of skill acquisition: 1) she did not communicate with words or symbols, and 2) she was not able to consistently select a known stimulus in an array of three or four response options within 5 seconds. Even though she did not meet these inclusion criteria, she was observed because her cognitive and behavioral profile is representative of many of the students who receive *enCORE* instruction. Her results are discussed separately because her data were highly variable due to inattention and challenging behaviors, and considered less reliable than the results of the study participants. That is, for some trials, she did not attend to the verbal instruction or threw probe materials in the air, hence it was difficult to know with confidence what she knew and did not know.

The student results address whether *enCORE Elementary* instruction provided in this study led to improvement in ELA and math skills over a five-month period and generalization at a three-week follow-up point for ELA and a four-week follow-up point for math. For each student, only skills for which the student scored below 80 percent at pre-test are presented.

ELA SKILLS

At pretest, participants scored an average of 37.1% across all ELA skills. At posttest, they scored an average of 89.0% (see the blue and green bars in Figure 1). On the generalization assessment given at a three-week follow-up point, they scored an average of 94.8% (see the yellow bar in Figure 1), demonstrating retention and generalization of targeted ELA skills three weeks after the posttest. At pretest, Diego showed difficulty in all skill areas except for letter identification, and Henry showed difficulty in all skill areas except for vocabulary. Hence, letter identification for Diego and vocabulary for Henry were excluded from the comparisons. Diego mastered ELA skills in all subdomains at the posttest except for writing (50%). On phonemic decoding, Diego scored 80% at posttest and 80% at the three-week follow-up. He was not probed on phonemic decoding at pretest, although the teacher reported that Diego was not able to decode any text in the fall. Henry mastered ELA skills in all subdomains at the posttest except for phonological awareness (74%) which increased to 100% on the generalization assessment given three weeks following the posttest. ELA results disaggregated by skill area are depicted in Figure 5 in Appendix A for Diego and Figure 6 in Appendix A for Henry.

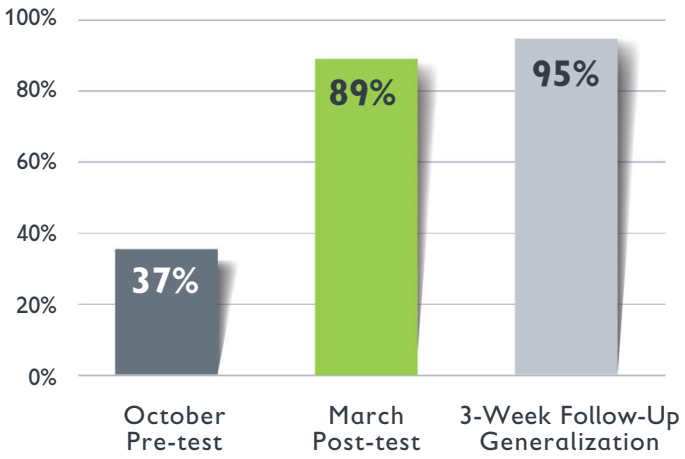


Figure 1. ELA scores before and after five months of instruction in Units 1-3, and at a three-week follow-up assessment to check generalization.

MATH SKILLS

At pre-test, participants scored 31.2% on average across all math skills. At post-test, they scored 92.2% across all targeted math skills (see the blue and green bars in Figure 2). On the generalization assessment given at a four-week follow-up point, they scored 92.2% (see the yellow bar in Figure 2), demonstrating retention and generalization of targeted math skills after six months. At pre-test, Diego showed difficulty in all math skill areas except for number identification and geometry; Henry showed difficulty in all math skill areas. At post-test, Diego mastered math skills in all subdomains; Henry mastered math skills in all subdomains except for time (75%) which remained the same on the generalization assessment, and money (31%) which increased to 51% on the generalization assessment given four weeks following the post-test. Math results disaggregated by skill area are depicted in Figure 8 in Appendix B for Diego and Figure 9 in Appendix B for Henry.

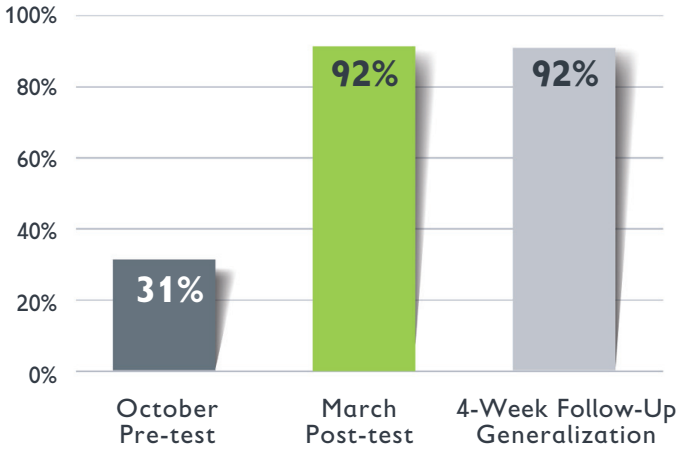


Figure 2. Math scores before and after five months of instruction in Units 1-3, and at a four-week follow-up assessment to check generalization.

PARTICIPANTS WITH PROFOUND AUTISM NOT MEETING THE STUDY INCLUSION CRITERIA

ELA SKILLS

At pre-test, Ani scored 26.4% on average across all ELA skills. At post-test, she scored 49.4% on average across all targeted ELA skills (see the blue and green bars in Figure 3). On the generalization assessment given at a three-week follow-up point, she scored an average of 53.8% across skills (see the yellow bar in Figure 3), demonstrating retention and generalization of the ELA concepts and skills she had improved. Although she improved six out of seven targeted ELA skills, she had not reached mastery criterion for any targeted ELA skill. Ani's ELA results disaggregated by skill area are depicted in Figure 7 in Appendix A.

MATH SKILLS

At pre-test, Ani scored 30.4% on average across all math skills. At post-test, she scored 71,8% on average across all targeted math skills (see the blue and green bars in Figure 4). On the generalization assessment given at a four-week follow-up point, she scored an average of 73.2% across skills (see the yellow bar in Figure 4) from pre-test, demonstrating retention and generalization of the math skills she had improved. Ani reached mastery at the four-week follow-up generalization assessment on two out of five targeted math skills. Ani's math results disaggregated by skill area are depicted in Figure 10 in Appendix B.

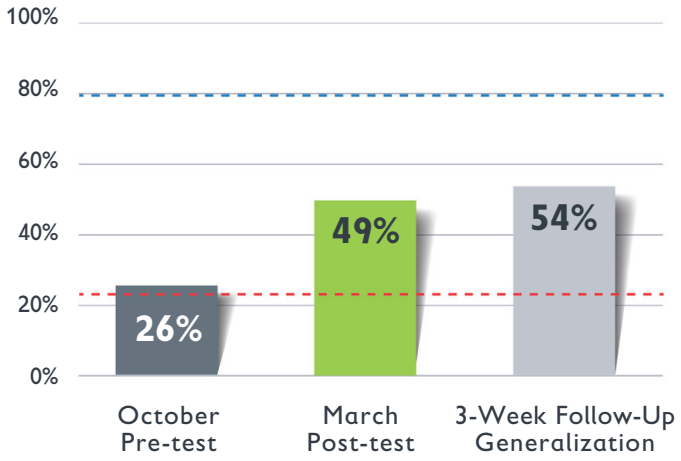


Figure 3. Ani's ELA scores before and after five months of instruction in Units 1-3, and at a three-week follow-up assessment to check generalization.
The red dashed line indicates chance level performance for most of the ELA assessment items and the blue dashed line indicates the mastery criterion.

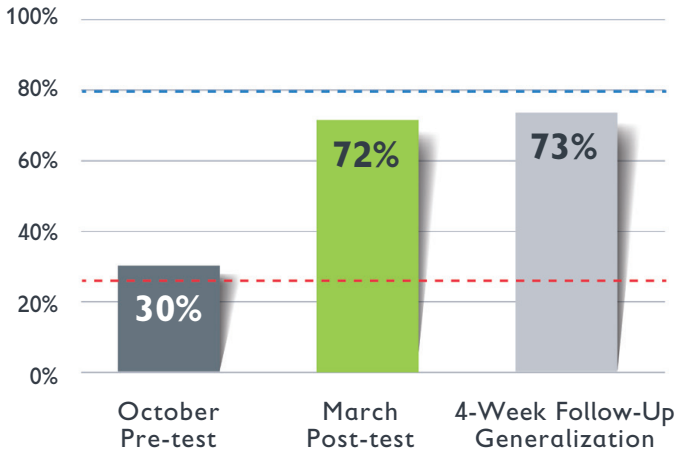


Figure 4. Ani's math scores before and after five months of instruction in Units 1-3, and at a four-week follow-up assessment to check generalization.
The red dashed line indicates chance level performance and the blue dashed line indicates the mastery criterion.

SOCIAL VALIDITY RESULTS: WAS THE PROGRAM ACCEPTABLE AND SATISFACTORY?

Results of the social validity surveys are rated on a scale of 1 (not satisfied at all) to 4 (highly satisfied).
The average ratings for the teacher, students and parents were 3.6, 3.4 and 3.4, respectively.
These averages indicated "satisfied" to "highly satisfied" levels of satisfaction with *enCORE Elementary*.
Average ratings by topic indicated "satisfied" to "highly satisfied" levels of satisfaction for all topics (see Table 5).

Table 1. Average Ratings on the Social Validity Survey by Topic

Topic	Respondent	Average Rating
Skills Taught	Teacher, Parents	3.5
Effects of enCORE	Teacher, Parents, Students	3.4
Scripted Lessons	Teacher, Students	3.3
Adapted Storybooks	Teacher, Students	3.8
Online Dashboard	Teacher	3.5
Technology Lessons	Teacher, Students	3.4

The teacher reported "The ABA approach to instruction has been very valuable in engaging my most challenged learners," and "The students love the story selections."

DISCUSSION

The purpose of this study was to evaluate the feasibility of implementing *enCORE Elementary* in a K-5 self-contained classroom for students with moderate to severe disabilities. The study also sought to determine the effectiveness of *enCORE Elementary* for teaching grade-aligned elementary ELA and math content to students with moderate to severe developmental disabilities and the extent to which the teacher, her students and their parents or caregivers accepted the program. The findings of the present study are promising. The teacher was able to implement the program and individualize instruction to meet the learning needs of all of the students in a highly diverse and challenging K-5 classroom.
The teacher and her students seemed to enjoy using enCORE, and they, as well as the students' parents or caregivers, thought *enCORE Elementary* was beneficial.

The effectiveness results are also promising. Prior to *enCORE Elementary*, students demonstrated difficulty in almost all ELA and math skill areas. Study students' average pre-test score for ELA was 37%. After five months of instruction in *enCORE Elementary*, the percent of correct responses increased to 89%, and at a three-week follow-up, average correct responses on a generalization assessment was 95%. Students demonstrated mastery of a broad range of targeted ELA skills including phonological awareness, letter identification, phonemic decoding, word identification, vocabulary, comprehension and print literacy.
Writing was the only ELA skill area in which improvement was not observed at the end of five months. Students generalized all of their acquired ELA skills to novel content or materials three weeks after the post-test was given.

Students' average pre-test score for math skills was 31%. After five months of instruction in *enCORE Elementary*, the percent of correct responses increased to 92%, and at a four-week follow-up nearly six months after the pre-test, average correct responses on a generalization assessment of math skills was 92%. Students mastered almost all math skills including reciting numbers in a sequence, number identification, counting with one-to-one correspondence, solving addition and subtraction problems using manipulatives, measurement concepts, money concepts, and geometry concepts. Even though mastery was not reached at the end of five months for two math skills, substantial improvement was observed for telling time and modest improvement for counting money. Students generalized all of the targeted math skills to novel content, materials or setting four weeks after instruction ended.

Ani, the student who did not meet the study inclusion criterion because was not able to consistently select a known stimulus from an array of three or four response options, also showed improvement in ELA and math skills, despite the high level of variability in her data. At pre-test, Ani scored 26% in ELA. After five months of instruction in enCORE, her score increased to 49% on the post-test and 54% on the three-week follow-up generalization assessment. She made even larger gains in math. At pre-test, she scored on average 30% in math. After five months of instruction in enCORE, her score increased to 72% on the post-test and 73% on the four-week follow-up generalization assessment.

There are three limitations to the current study that are important to point out. First, the study was limited in the lack of a control group. While no causal relationship can be drawn from this study due to possible confounding variables (e.g., maturation), the results are very promising. Second, *enCORE* was implemented by one teacher. Even though her experience using *enCORE* was limited (she had one year of experience using some components of *enCORE* prior to the study), and she only received six hours of training and two follow-up coaching visits, we cannot determine what portion of the gains are attributable to the influence of the participating teacher rather than to *enCORE*. A third possible limitation was due to the high number of days students were absent from school causing them to miss instructional sessions. Also, the teacher had a medical leave of absence during the course of the study resulting in her inability to teach for 10 days. Greater improvements may have been observed if student attendance had been higher and the teacher had taught all of the instructional sessions. Future research is needed that includes a control group and additional classrooms to determine a causal relationship between *enCORE* instruction and improvement of academic performance.

Despite these limitations, the current study demonstrates the promise of *enCORE* for teaching students with moderate to severe disabilities a broad range of grade-aligned ELA and math elementary content in a highly diverse and challenging K-5 classroom. The study provides evidence that *enCORE Elementary* instruction provided in this study was effective for improving literacy and math skills for students with moderate to severe developmental disabilities. In all skill areas except for writing, *enCORE* students not only retained skills over nearly six months, but also generalized those skills to novel content, materials, or setting, depending on the skill.

APPENDIX A: ELA RESULTS by SKILL

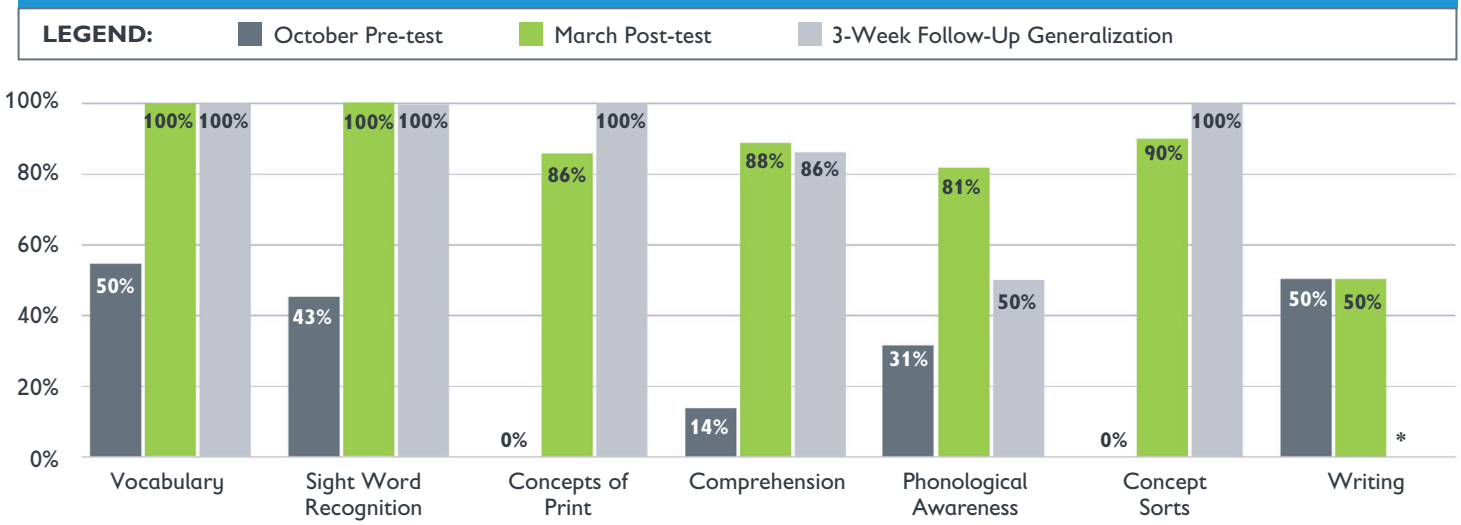


Figure 5. Diego's ELA performance (percentage correct) by ELA skill before and after five months of instruction in Units 1-3, and at a follow-up assessment given three weeks after the post-test to check generalization.

**Follow-up data were not collected for writing because the student did not make gains on this skill.*

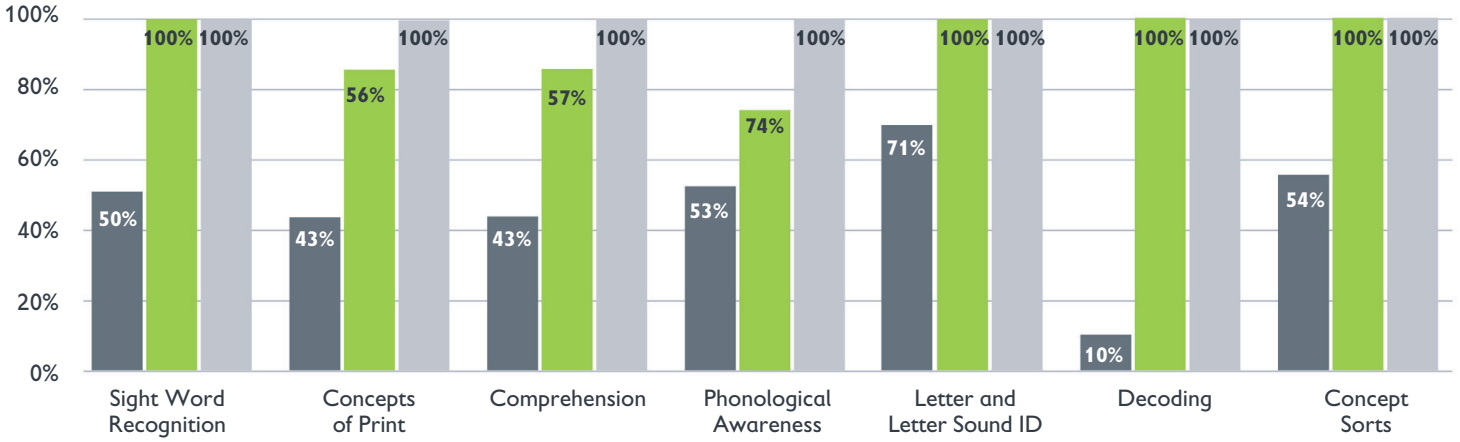


Figure 6. Henry's ELA performance (percentage correct) by ELA skill before and after five months of instruction in Units 1-3, and at a follow-up assessment given three weeks after the post-test to check generalization.

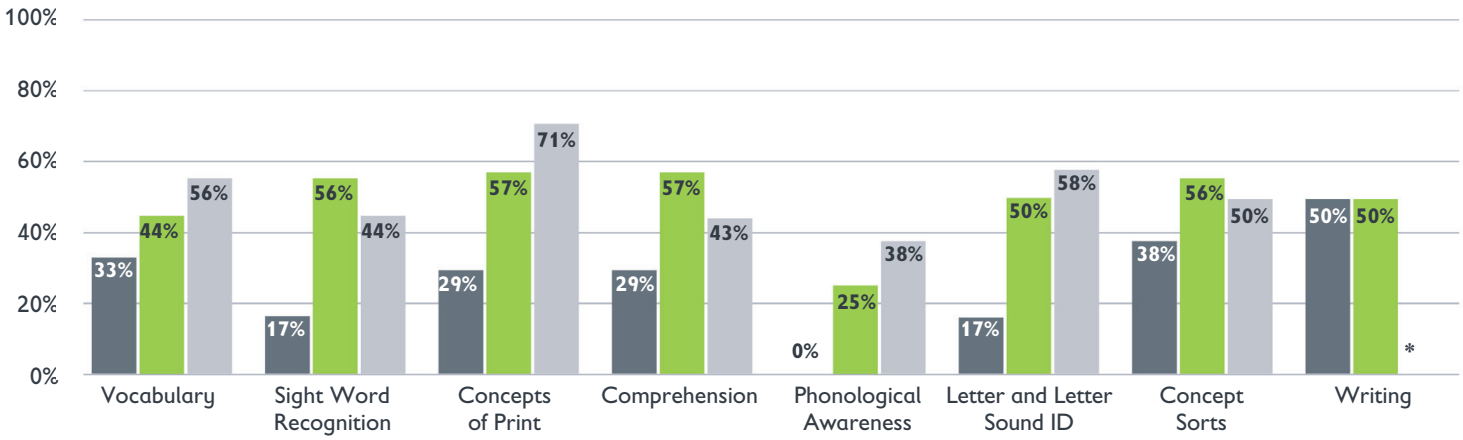


Figure 7. Ani's ELA performance (percentage correct) by ELA skill before and after five months of instruction in Units 1-3, and at a follow-up assessment given three weeks after the post-test to check generalization.

**Follow-up data were not collected for writing because the student did not make gains on this skill.*

APPENDIX B: MATH RESULTS by SUBDOMAIN

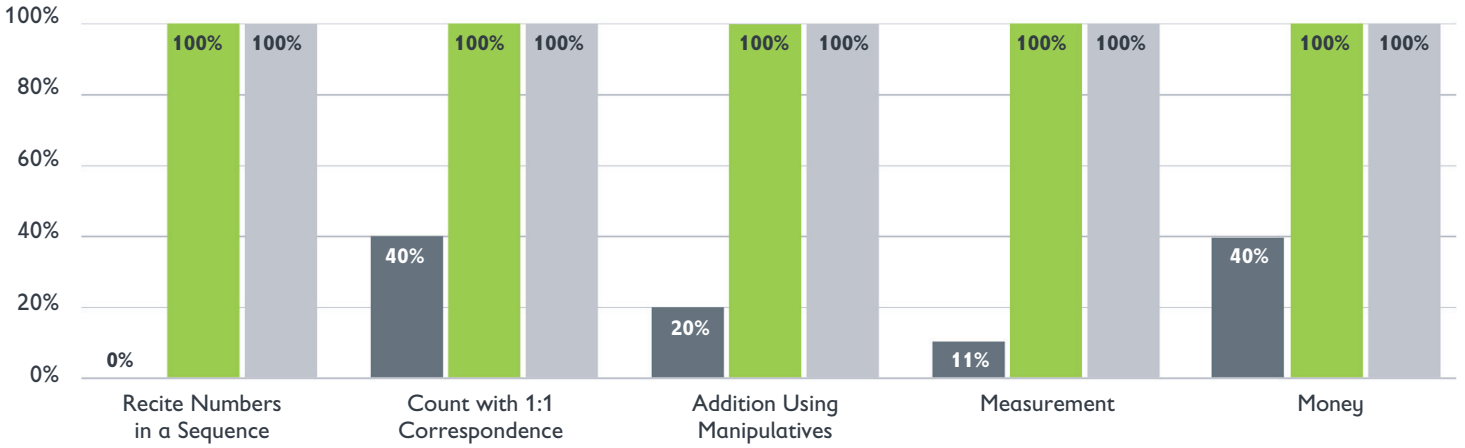


Figure 8. Diego's math performance (percentage correct) by math subdomain before and after five months of instruction in Units 1-3, and at a follow-up assessment given four weeks after the post-test to check generalization.

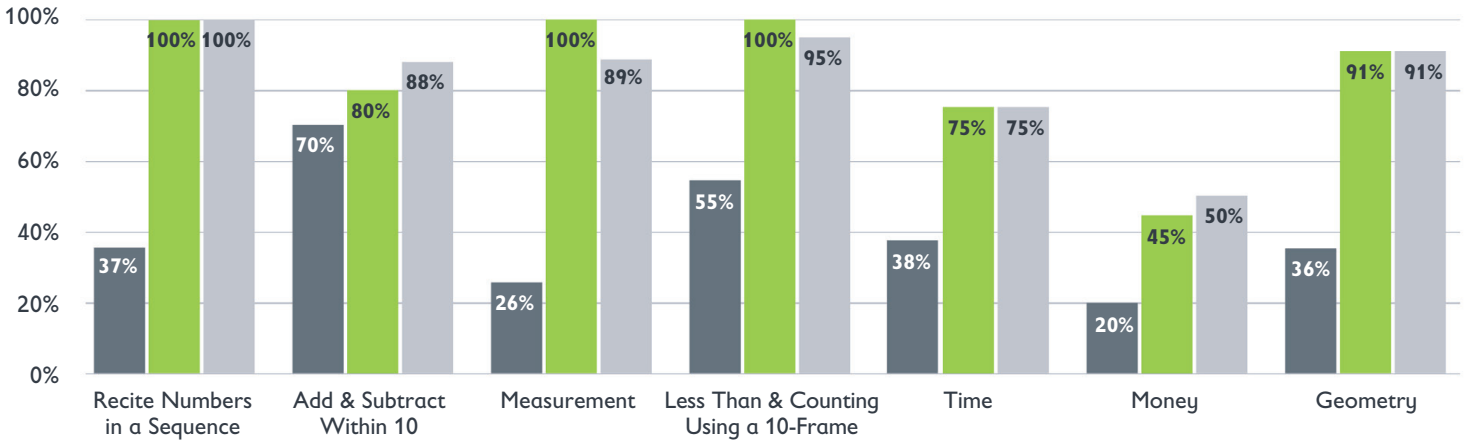


Figure 9. Henry's math performance (percentage correct) by subdomain before and after four months of instruction in Units 8-10, and at a follow-up assessment given four weeks after the post-test to check generalization.

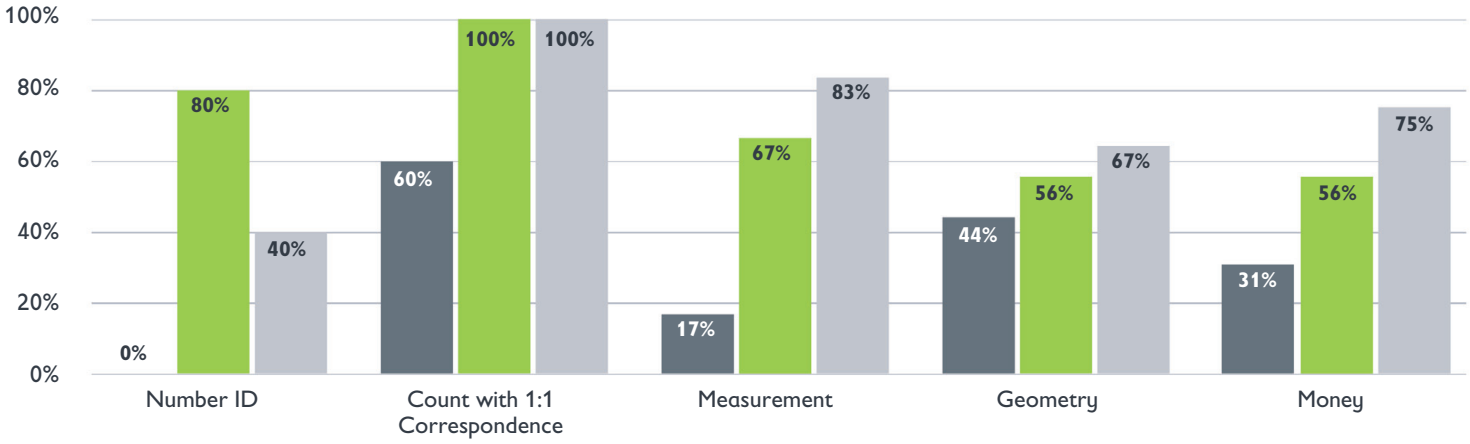


Figure 10. Ani's math performance (percentage correct) subdomain before and after five months of instruction in Units 1-3, and at a follow-up assessment given four weeks after the post-test to check generalization.

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