

## EQUALS MATH CURRICULUM White Paper, Year One

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From 2011 to 2015, a 4-year Equals math curriculum study was conducted. The results of that study showed a significant increase in participants' math skills every year, with no reported regression. Following the study, a revision of Equals math curriculum was researched, planned, and completed. Retaining the inclusion of researched best practice instructional methodologies within a lesson structure that included all five National Council of Teachers of Mathematics (NCTM) Math Process Areas and an enhanced, ordered, and organized set of lesson objectives based on NCTM Math Content Areas, the new version of Equals math was launched.

Equals math curriculum builds upon the best-practice math instructional methods from general education that were successful in the original version of Equals math curriculum. The main instructional methodologies include: (1) activating and building background knowledge, (2) exploration of concepts and tools, (3) guided communication about math and learning, (4) teaching math vocabulary, (5) problem solving with a model shown prior to students solving a problem on their own, and (6) a concrete to semi-concrete to abstract learning sequence. A full page of practice and application activities are still present, replacing workstations with partner problem solving, and the vocabulary game with a second concept-based game.

Although Equals math curriculum has been very successful, research and discussion resulted in changes that enhanced the original version. The AbleNet curriculum team decided to expand teacher modeling, problem solving and communication opportunities, and the number of lessons teaching the four operations by utilizing problem types. The lessons include skills from pre-readiness to the end of fourth grade (general education). Problem solving models and opportunities were increased with more interaction and communication, including modeled discussions that guide students in answering questions about what they know and want to know and how to complete the process for solving a problem. Additional teacher and student supports were included, and connections within and between math content areas were made with a keener eye towards application of earlier concepts to related, more complex concepts in later chapters.

The new lesson structure increases time spent on concepts, tools, actions, and strategies so students become familiar with them. Problem solving was simplified and strengthened with a 5-step method for thinking about 1) facts, 2) action(s) to take, 3) an estimate/prediction of the solution, 4) choosing tools and a strategy, and 5) applying those choices when solving each problem. Given two selected math strategies and identified, modeled actions by the teacher, students have a chance to see what problem solving looks like throughout the lesson. With built-in support provided at three levels, integrated tool-workmat connections, and hands-on actions and communication supported, students have what they need to make sense of the facts of each problem and complete the next steps. Finally, a new feature engages students in a discussion after the problem is solved in an exploration of how it was solved, and how changes of relevant and irrelevant facts may or may not affect the problem prompts and its solution. These approaches give students with disabilities (including significant cognitive challenges) the chance to be active problem solvers to the best of their abilities.

Adjustments were made to the Equals assessment. The nature of the test items was adjusted to include benchmarks only, not one test item for every lesson objective as was present in the original version. The basal and ceiling were reduced from five items to three items. Test item versions increased from two to three:

- **Typical version:** administered to students who can answer questions and move objects on the table to complete a task in a typical way
- **Accommodation version:** used when a student can handle the cognitive rigor of the typical version but requires support for language and motor tasks
- **Adaptation version:** provides the most cognitive, language, and motor support of all three versions. Because of the cognitive reduction in the test items, Adaptation version items are scored half a point instead of one point for each correct item.

By the end of fall, 2017, a new Equals math curriculum study was well underway at the Developmental Learning Program, in a southern suburb of Chicago. The school year ended with assessment results from 50 students. In this study, instruction using the revised Equals math curriculum was provided to participating students daily for forty (40) minute sessions in small group settings (3 to 8 students per group) from September through May.

A total of 21 teachers and 50 students with disabilities in grades 1-6 (ages 6-12) engaged in the revised Equals math instruction for the whole school year. The disabilities of the participating students included intellectual disabilities (mild, moderate, and severe), autism, speech language impairment, developmental disabilities, emotional disorder, physical impairment, and other health impairments.

Baseline information for new participants was collected in September of 2017, at the start of the school year. Post intervention progress for all participants was assessed in April of 2018. All progress was recorded using the Equals assessment protocol.

Over the course of the school year, the participating students demonstrated an average gain of 17.67 points as measured by the Equals assessment protocol. This reflects average gains of 41.37% over the baseline recorded in September of 2017. As in previous studies of the Equals math curriculum, every student in this cohort demonstrated progress. Analysis of sub-groups indicates results similar to those observed in year one of the initial 4-year study.

Equals math curriculum is presented on three levels which generally correspond to levels of intellectual disability: Level 1 (most support) Level 2 (moderate support), and Level 3 (least support). There were students who advanced from one level to another during the same year. For consistency, we considered each student as being within the level in which they began the year.

In this study, students working at Level 3 achieved greater progress (21 points) than that of students as a whole. While it is statistically accurate to observe that Level 1 and 2 students achieved to a lesser degree, it should not be overlooked that these students still made meaningful and measurable progress (12.8 and 13.9 points respectively). These students are traditionally the ones who need the most support and those for whom effective math instruction has been the most difficult to provide.

When we explore the progress made by other subgroups, it is also useful to observe that students on the autism spectrum demonstrated greater progress (18.5588 points) than the average of all students.

In particular, students on the autism spectrum working at Level 2 achieved greater gains (20.08 points). In addition, students with intellectual disabilities working at Level 3 demonstrated the greatest gains overall (24.5 points). Also worth noting were the results for students with developmental disabilities who were working at Level 3 (22.25 points). Further, all males in this study demonstrated gains that were greater than the average of all students (18.02 points).

The results from this study indicate that students who are engaged in Equals math instruction make demonstrable progress. Many of the students in this study are among the most challenging students to teach math. The success noted in teaching students at Levels 1 and 2 in this study is of particular importance. These students are often given alternative assessments instead of being included in standardized testing. To have a systematic math curriculum that can support effective direct instruction with measurable outcomes for these students is truly noteworthy.

## EQUALS 2017

### All Students

	N	Fall 2017	Spring 2018	17-18 Increase	% Increase	pValue
All Students	50	42.6900	60.3500	17.6600	41.37%	0.0000

### Students by Level

Levels	N*	Fall 2017	Spring 2018	17-18 Increase	% Increase	pValue
Level 1	4	29.2500	41.8750	12.6250	43.1624%	0.0835
Level 2	31	34.3387	51.0323	16.6936	48.6145%	0.0000
Level 3	15	63.5333	84.5333	21.0000	33.0535%	0.0000

\* Students recorded progress from level at which they started. Several students advanced to the next level during the year.

### Students by Disability Category

Disability	N*	Fall 2017	Spring 2018	17-18 Increase	% Increase	pValue
IntD	19	32.6053	49.0000	16.3947	50.2823%	0.0000
ASD	17	45.6765	64.2353	18.5588	40.6310%	0.0000
DD	10	37.3500	54.4500	17.1000	45.7831%	0.0000
SLI	7	37.9286	54.2857	16.3571	43.1261%	0.0001
MD	3	54.6667	73.3333	18.6667	34.1464%	0.0736
OHI	2	24.5000	43.5000	19.0000	77.5510%	0.1638
PI	2	26.0000	43.2500	17.2500	66.3462%	0.2213
ED	1	120.0000	138.0000	18.0000	15.0000%	NA
TBI	1	122.0000	143.0000	21.0000	17.2131%	NA

\* Several students were identified in multiple categories.

### Students by Disability by Level

Disability	N*	Fall 2017	Spring 2018	17-18 Increase	% Increase	pValue
<b>IntD</b>						
Level 1	4	29.2500	41.8750	12.6250	43.1624%	0.0835
Level 2	10	30.0500	43.9000	13.8500	46.0899%	0.0001
Level 3	5	40.4000	64.9000	24.5000	60.6436%	0.0080
<b>ASD</b>						
Level 1	0					
Level 2	12	38.4583	58.5417	20.0833	52.2210%	0.0000
Level 3	5	63.0000	77.9000	14.9000	23.6508%	0.0023
<b>DD</b>						
Level 1	0					
Level 2	6	23.0833	36.7500	13.6667	59.2060%	0.0027
Level 3	4	58.7500	81.0000	22.2500	37.8723%	0.0026
<b>SLI</b>						
Level 1	1	17.0000	31.0000	14.0000	82.3529%	NA
Level 2	5	25.7000	42.2000	16.5000	64.2023%	0.0019
Level 3	1	120.0000	138.0000	18.0000	15.0000%	NA

**EQUALS 2017**

**Students by Disability by Level (cont.)**

<b>Disability</b>	<b>N*</b>	<b>Fall 2017</b>	<b>Spring 2018</b>	<b>17-18 Increase</b>	<b>% Increase</b>	<b>pValue</b>
<b>MD</b>						
Level 1	0					
Level 2	3	54.6667	73.3333	16.6667	30.4878%	0.0736
Level 3	0					
<b>OHI</b>						
Level 1	1	17.0000	31.0000	14.0000	82.3529%	NA
Level 2	1	32.0000	56.0000	24.0000	75.0000%	NA
Level 3	0					
<b>PI</b>						
Level 1	0					
Level 2	2	26.0000	43.2500	17.2500	66.3462%	NA
Level 3	0					
<b>ED</b>						
Level 1	0					
Level 2	0					
Level 3	1	120.0000	138.0000	18.0000	15.0000%	NA
<b>TBI</b>						
Level 1	0					
Level 2	0					
Level 3	1	122.0000	143.0000	21.0000	17.2131%	NA

**Students by Gender**

<b>Gender</b>	<b>N*</b>	<b>Fall 2017</b>	<b>Spring 2018</b>	<b>17-18 Increase</b>	<b>% Increase</b>	<b>pValue</b>
Males	37	44.8649	62.8919	18.0270	40.1806%	0.0000
Females	13	36.5000	53.1154	16.6153	45.5214%	0.0000