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The Effect of iReady Mathematics Intervention on Student Achievement for Students in Kindergarten & First Grade

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An Action Research Report

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Abstract

The purpose of this research is to examine the effects of the implementation of iReady mathematics intervention on student achievement. The study was conducted in a public school setting in two kindergarten classrooms and one first-grade classroom. The classrooms consisted of a total of 55 students between the ages of five and seven. Out of the 55 students, 12 qualified for the iReady intervention program. Data collection methods included district baseline and summative assessments, AimsWeb Progress monitoring assessment, a teacher observational journal, and a student conference form. After the four week implementation of the iReady mathematics intervention our data indicated increased student achievement for students performing below grade level and above grade level. However, the assessment data showed it was more effective for the below level students. Based on these results we will continue to implement the iReady mathematic intervention program in order to continue to increase student achievement.

In recent years as teachers working in the primary grades in our school district we noticed a need for more differentiated mathematics interventions. We have found our district provides an adequate amount of intervention resources and support in the area of reading but a very limited amount of resources and support in mathematics. There are 21 district approved reading interventions teachers can choose from to meet the needs of every student. However, there are only four district approved mathematic interventions. For this reason we saw the need to search for an effective mathematic intervention to use with students at all levels. After researching mathematics interventions we have chosen to implement iReady.

This research took place in three classrooms consisting of kindergarten and first-grade students. Student participants were selected through our district Response to Intervention (RTI) process. All students were required to take district baseline assessments and students who scored well below average or well above average qualified for an intervention plan.

Students who qualified to receive a mathematic intervention began using iReady. This program is an online, adaptive, individualized computer based intervention tool for students at all levels K-12. At the beginning of the intervention a diagnostic assessment determined students' individual areas of need. Upon completion of this assessment students were engaged in individualized lessons aligned to the Common Core State Standards (Common Core State Standards Initiative [CCSSI], 2010) which provided differentiated instruction (www.curriculumassociates.com).

The high number of students in need of a mathematics intervention along with the limited availability of district approved mathematics intervention programs generated the

need to research possible intervention programs. The critical question that was generated is: What effects will the implementation of iReady mathematics intervention have on student achievement for students in the kindergarten and first grade classrooms? The action taken to address this question was to implement the use of the online iReady intervention program.

Review of Literature

This section discusses how explicit interventions can support students in the area of mathematics. Interventions are an effective way to help both the low and high achieving students reach the academic gains that are necessary within the area of mathematics. This section examines best practices in mathematics interventions, the RTI process, and the use of technology to enhance mathematics intervention implementation.

Recently there has been a higher interest in the area of early mathematics difficulties because many students in the elementary school setting either do not achieve mathematic skills at the appropriate grade level or make the appropriate rate of growth (Bryant, Gersten, Scannacca, & Chavez, 2008). Research showed that about 5-10% of the school-aged population have skill insufficiencies in the area of mathematics (Bryant et al., 2008). Effective interventions are a vital tool needed in order to help prevent or remediate mathematic skill deficiencies (Mong & Mong, 2010). However, there are also many students who are achieving above grade level, but are still not making expected academic gains in the area of mathematics due to the fact that they are not being challenged in the classroom (Rotigel & Fello, 2004). They meet the requirements necessary to pass state assessments, but may not be receiving instruction at their level.

Mathematics Difficulties

According to the work of Gersten, Jordan and Flojo (2005), children who have mathematics difficulties include those who perform in the low average range or below the 35th percentile on mathematics achievement tests. They also reported that children might perform at an average level in some areas, but have deficits in others. The first step to helping these children succeed is identifying the skills they need to learn in order to help them overcome these deficits. One finding that has been consistent with many researchers is that students who struggled with mathematics in the elementary grades do not have automatic retrieval of basic facts (Bryant et al. 2008, Fuchs et al., 2008; Gersten et al., 2005). Students who have a hard time storing basic mathematical facts in their memory and easily retrieving them, have a hard time building "procedural and conceptual awareness of abstract mathematical principles, such as commutativity and the associative law" (Gersten et al., 2005, p. 295). Students lacking in the area of number sense have also been identified as having mathematics difficulties. Number sense has not been defined in the same way by all researchers, but its key elements include, but are not limited to, counting, number knowledge, number transformation and estimation (Jordan, Kaplan, Olah, & Locuniak, 2006).

On the other side of the spectrum there are many students who have mastered these basic mathematic skills, as well as their grade level skills, and are not being challenged enough. They are becoming bored and not making the gains in their mathematical knowledge. According to Cleaver (2008), "If high-achieving kids aren't challenged in elementary school, they turn off when they hit challenges in middle or high

school" (p. 30). One way to challenge these students is to differentiate their instruction through a mathematics intervention.

Mathematics Interventions

Intervention has become a very vital instrument for teachers to use in order to ensure that all students succeed (Jansen, 2005). According to Kroesbergen & Johannes (2003), "Intervention is defined as a specific instruction for a certain period to teach a particular (sub)domain of the mathematics curriculum" (p. 3). The type of intervention used will depend on how the student receiving the intervention learns best and which mathematics objective the learner is struggling to understand. The key is early identification and early intervention (Gersten et al., 2005). When a student does not acquire a mathematic skill after it has been taught or if the student has mathematic difficulties, the teacher must use effective intervention strategies. An intervention is proven to be effective when students secure the knowledge and skills they have been taught and can effectively apply their new knowledge and learning (Kroesbergen & Johannes, 2003). It is the responsibility of the teacher to understand what makes an intervention effective and what strategies constitute best practice in the area of mathematics interventions.

The first of these strategies is to teach students using explicit instruction. This practice includes modeling several different problems and utilizing think-alouds where teachers explain their thinking step-by-step as they solve a problem. Fuchs et al. (2008) stated that an effective intervention for students requires "an explicit, didactic form of instruction." (p. 84). According to Jayanthi, Gersten, and Baker (2008), "Explicit systematic instruction improves the performance of students with learning disabilities and

students with learning difficulties in computation, word problems, and transferring known skills to novel situations" (p. 5).

The importance of using multiple representations is another effective strategy. These may include visuals, models, manipulatives, real-life examples, and symbolic representations to differentiate the intervention. Janzen (2005) noted that some students may have difficulties understanding concepts when presented symbolically, but they may understand the same concepts when presented concretely through the use of manipulatives, visuals, or technology. Thus, this type of modified instruction is critical in interventions.

Another recommendation is to have students verbalize their solutions to a math problem. Allowing students to think-aloud (e.g. math talks) is an important part of scaffolded instruction according to Jayanthi et al. (2008). Having students walk to learn in mathematics class can also help scaffold instruction and can help teachers identify areas of misunderstandings for students.

Jayanthi et al. (2008) stated that a contemporary trend in mathematics today that can assist in mathematics interventions is to teach students to use multiple strategies for solving problems. This approach does not require students to memorize a specific strategy, but allows students to utilize the strategy that works best for them.

Providing peer assisted instruction is a beneficial instructional strategy according to Janzen (2005). Small groups or student pairs may be less intimidating for some students who do not feel comfortable sharing in a large group. Students may benefit from hearing the explanation from a peer. Many times these peer-communications make more sense to them.

Fuchs et al. (2008, p. 84-85) noted that choosing an instructional design that is carefully sequenced and integrated so as to eliminate misunderstanding and minimize the learning challenge is important in effective math interventions. Drill and repeated practice, cumulative review, and motivators to assist with student attention are three other important principles when choose math interventions according to Fuchs et al. (2008, p. 86).

One of the most essential parts of mathematic interventions is to provide ongoing progress monitoring or formative assessment (Fuchs et al., 2008, p. 86). The information and data generated from ongoing progress monitoring may help teachers to validate if an intervention is working. It can also provide performance feedback, instructional tips, as well as help the teacher decide how to group students, what to teach, and how to differentiate the instruction (Jayanthi et al., 2008, p. 10).

The RTI Process

One way to identify which students are in need of mathematics intervention is through a process called Response to Intervention (RTI). "Response to Intervention (RTI) is a multi-tiered approach" schools use for the early identification of students with learning and behavioral needs (RTI Action Network, 2014, p. 1). To implement an RTI approach, schools must support students with high-quality scientifically based classroom instruction, differentiated instruction, ongoing student assessment, and family involvement (Burns, 2014). When beginning the RTI process teachers will use a universal form of screening to identify students that are performing below grade level or even well above grade level in the general education classroom. In 2012, Lembke, Hampton, and Beyers advised that as a guideline, the screening tool should be

administered three separate times during the academic school year (e.g., fall, winter, and spring) to ensure all struggling students are continuously identified (p. 258). Once teachers and specialists identified these students, they can work together to develop a systematic approach to ensure that all students succeed in the classroom. The identified students continued to be provided with interventions at increasing levels of intensity to boost their rate of learning (RTI Action Network, 2014). While interventions took place, students were closely monitored through progress monitoring to assess their learning rate and level of performance in that area of instruction. With the data collected from progress monitoring, a team of educators analyzed the data and made decisions about the intensity and duration of the intervention being used with that particular student.

Using Technology to Enhance Mathematics Interventions

The use of technology helped enhance the RTI process as well as student learning (Burns, 2014; Ysseldyke & Bolt, 2007). Technology can aid students' learning by allowing them to learn and understand new mathematical concepts through many representations (Suh, Johnston, & Douds, 2008). There have been recent studies conducted that confirm there are certain technology-enhanced interventions that will improve learning for students at many achievement levels (Burns, 2014; Roschelle, Pea, Hoadley, Gordin, & Means, 2000). Computer mediated interventions have proven to be effective due to the use of animations, visuals, video, audio, and narration (Nusir, Alsmadi, Al-Kadi, Sharadgah, 2012). Instruction delivered through these various modes, is a more effective way of reaching different types of learners. Students who learn visually, auditorily and/or kinesthetically are able to benefit from technology-enhanced interventions (Nusir, et al., 2012, p. 19-20). Programs with interactive software engage

students and allow for interventions with limited supervision required. Such programs can be used to target explicit skills and objectives, while providing immediate feedback (Burns, 2014; Roschelle et al., 2000). Computer mediated interventions allow below-level students repeated practice of skills and may engage high ability students in more challenging tasks (Suh et al., 2008). Roschelle et al. (2000) stated that positive effects of technology-enhanced interventions are especially strong for students who are low or middle achievers. Rotigel and Fello (2004) noted that technology can assist the gifted mathematics students by providing opportunities to advance at their own rate while exploring more complex mathematical ideas at their level.

Technology-enhanced programs are not only effective for student learning, they also offer extended support for teachers. According to Burns (2014) and Yesseldyke and Bolt (2007), the methods of support include data-management systems to assist with the use of acquiring and organizing data as well as providing any instructional recommendations needed for differentiation. These data-management systems are especially helpful when progress monitoring a student through the RTI process. Using this approach will more likely enhance the performance of the students who are participating in the intervention(s). Technology-enhanced programs are also beneficial to use in order to evaluate student responses to the intervention programs (Ysseldyke & Bolt, 2007). Teachers need to monitor whether the intervention is working and if the student is making academic gains. Technology-enhanced programs can assist in this process for teachers by providing organizational charts and graphs of student progress.

The inclusion of mathematic interventions in the classroom is crucial to the success for both low and high-achieving students. Teachers may evaluate the current

level of their students' achievement through the RTI process to identify those students who are not making academic gains. Studies in the field of mathematics have shown numerous ways to incorporate best practices in the area of mathematics interventions. These best practices along with the use of technology-enhanced intervention programs are effective ways to help our students make the necessary academic gains in order to achieve success.

In the next section of this paper we will describe our action research process. This description will include details of our data collection and procedures along with a description of our process as we implemented the iReady program.

Description of Research Process

We conducted our research project in a public school setting in two kindergarten classrooms and one first-grade classroom. The classrooms consisted of a total of 55 students between the ages of five and seven. Thirty-seven students were in kindergarten and 18 in first grade. There were 31 boys and 24 girls. Through the RTI process, 12 students qualified for the iReady mathematics intervention; five students who tested above grade level and seven students who tested below grade level. The students who qualified spent approximately 15 minutes per day and at least four days a week on this intervention program. The program consisted of mini-lessons that are CCSS aligned and individualized for each of the student's needs. Each lesson focused on a skill tutorial and practice session, followed by a quiz. Every time a student completed a lesson the student earned points to play games, unlock different backgrounds, and choose a different Avatar during the upcoming sessions.

A variety of data collection methods were used to determine what effects the implementation of iReady mathematics intervention would have on student achievement. These data collection methods were used for students in the kindergarten and first-grade classrooms whose assessment results indicated they were well above grade level or well below grade level. These data collection procedures included: (1) district baseline and summative assessments, (2) Aimsweb progress monitoring assessment, (3) observational journal, and (4) student conferences.

Our first method of data collection was the district baseline and summative assessments. The baseline assessments were given prior to the beginning of the study in all three classrooms. Kindergarten students were assessed on counting to one-hundred by ones and tens (Appendix A), number identification to twenty (Appendix B), and identifying quantities up to twenty (Appendix C). We assessed first-grade students on writing numbers to one-hundred twenty starting at any given number (Appendix D), identifying place value for tens and ones (Appendix E), and fluently adding to ten (Appendix F). All of these assessments were scored using standards- based rubrics that are Common Core State Standards aligned (Appendix G). The scoring scale on the rubrics ranged from 0.5-4.0. These assessment scores were used in the RTI process to identify which students qualified for the iReady mathematics intervention. Any students who scored a 0.5, on at least two of these assessments, was considered below grade level according to our district RTI process and participated in the iReady intervention program. Students whose scores ranged from 1.0-3.0 meant they were performing at grade level expectation for that standard, at the beginning of the school year. These students did not qualify for a mathematics intervention, but still received differentiated instruction (along

with all students) through guided math groups. Any students who scored above a 3.0 were considered to be above grade level and used the iReady intervention program to help differentiate their instruction. The same assessments were also used at the end of the action research project as summative assessments to show what progression was made in each area.

The second data collection source was AimsWeb progress monitoring assessments. This curriculum-based measurement for progress monitoring was designed for K-8 students (NCS Pearson, Inc., 2004). It had a variety of probes for teachers to choose from based on student need. For the kindergarten students who were below grade level we chose to use the oral counting progress monitoring probe (Appendix H) because it is the lowest progress monitoring probe. This probe simply had the students count in numerical order. For kindergarten students who were above grade level we chose to use the Mathematics Computation probe (Appendix I). We chose to use this probe because it was an above grade level assessment at the students' level that would best show their academic progress. This probe consists of 28 addition and subtraction problems for the students to solve. With first-grade students who were below grade level we chose to use the missing number progress monitoring probe (Appendix J). This probe consists of three numbers in numerical order with a line substituting for one of them. The student needed to state the missing number for each row of three numbers (e.g., 7___9). For first-grade students who were above grade level we used the Mathematics Concepts and Applications probe (Appendix K). We chose this probe because it was a measure of the skills the students were working on in the iReady program. It consisted of a variety of mathematic skills such as story problems, reading graphs, telling time, and money.

Students were progress monitored once per week, on their individualized skill, during the duration of the research project. This progress monitoring assessment showed us how each student was progressing in their specific area of need.

Another data source we utilized was a teacher observational journal (Appendix L). We used this tool to document students' motivation to use iReady by documenting how they acted before, during, and after each lesson of the program. We also noted their on-task behavior and fidelity to the program by documenting how many times per week the student used iReady and if they were engaged during the lesson. This information told us how effective the program was at engaging our students. It also offered a place for us to document any unexpected behaviors that occurred.

Our fourth data collection source was a student conference form (Appendix M). The data from this conference was used to analyze student perception on their feelings about using iReady. The students were asked to respond to only three simple statements due to the age of the participants. The conference form asked the participating students to rate how they felt about the following statements: I like using iReady, I feel I am getting better at math by using iReady, and I would like more time to work on iReady. We recorded student responses on a Likert scale with the answer options of: a smiley face meaning a lot, a straight face meaning OK, and a sad face which meant not at all. In addition to the Likert scale statements, we asked students to respond to the following questions: What was the best thing about using iReady? Is there anything you didn't like about using iReady? Would you rather learn math skills by using blocks, worksheets, games, or iReady? Is there anything else you would like to tell me about using iReady? Due to the fact that most of the participants had limited writing and reading skills, we

read the questions to them and recorded student responses on the conference form for them. Once the students had used iReady for one week, we met with them one-on-one to fill out the conference form. We also met with each student at the end of the project to see how or if their feelings changed.

The data was collected before, during, and after the intervention. The students were assessed to see if they qualified for the iReady math intervention program and then throughout the intervention to see what type of impact the program had on helping students to progress in his/her mathematics skills. At the end of the research project, the students were assessed to see what overall effect the iReady intervention had on students' learning of mathematics skills. Conferencing throughout the study helped us to find out what was working for each student and what changes needed to be made in order for the intervention to be more successful in each individual case.

Data Analysis

A variety of data collection methods were used for this research. Our district baseline and summative assessments were administered before and after the intervention. This data collection method helped the teachers to identify students who were performing below, on, and above grade level. Students who were identified as performing below or above grade level then participated in the AimsWeb progress monitoring. These students were progress monitored once a week. Another data collection method we used for this research was an iReady student conference form. Classroom teachers met with students in the middle of this study and again at the end to gather data about their performance and feelings about using the iReady program. Teachers also completed student behavior

journals to track student's participation in the program and the number of lessons completed during the course of this research.

Our first method of data collection was the district baseline and summative assessments. These were given two times; once as a baseline prior to the mathematics iReady intervention and again after four weeks of implementing the intervention. Seven kindergarten students completed the following assessments: Identifying Numbers to 20, Quantities to 20, and Counting to 100. According to our district rubric, five students scored below grade level and two scored above grade level on the baseline. Each score was recorded separately and the analysis consisted of comparing the baseline scores with the summative scores. The difference between the scores was recorded as a positive or negative change.

The data shows that the participating students using iReady mathematics intervention showed a positive change overall on all three assessments. On the Identifying Numbers to 20 assessment students' rate of growth change was a positive 3.5. Three out of five students who were identified as performing below grade level made a positive rate of growth while two of the students made no change at all. On the Quantities to 20 assessment, the students showed the highest rate of growth. All students who were identified as below grade level made a positive change. This could be due to the fact that the majority of the iReady lessons included the skill of quantities to 20 somewhere within the lesson. Last, on the Counting to 100 assessment, students showed a positive change of 2.5. Four out of five students below grade level made a positive change and one student showed no change. The students who were identified as performing above grade level made no change on all three assessments. We want to note

that the above grade level students were not able to show growth due to the fact that they had already reached the top score of the rubric on the baseline assessment thus had no room to show growth on the summative assessment. The results from the baseline and summative assessments and the differences between the two are represented in Table 1.

Table 1

Baseline Summative Kindergarten

		Identifying Numbers to 20			Quantities to 20			Counting to 100		
		B	S	C	B	S	C	B	S	C
Below Level	Student 3	1	2	+1	0.5	2	+1.5	1	1	0
	Student 4	0.5	1.5	+1	0.5	3	+2.5	1	1.5	+0.5
	Student 5	2	2	0	0.5	2	+1.5	1	1.5	+0.5
	Student 6	0.5	0.5	0	0.5	1	+0.5	0.5	1	+0.5
	Student 7	0.5	2	+1.5	1	2	+1	0.5	1.5	+1
Above Level	Student 11	4	4	0	3	3	0	4	4	0
	Student 12	4	4	0	3	3	0	4	4	0
Change totals				+3.5			+7			+2.5

Note. B = Baseline, S = Summative, C = Change
3.5-4 = Above Grade Level, 3 = At Grade Level, 1.5-2.5 = Progressing, 0.5-1 = Below Grade Level

Table 2 shows the baseline and summative scores and the difference between the two scores of our first-grade iReady participants. These assessments were also given two times; once as a baseline prior to the mathematics iReady intervention and again after four weeks of implementing the intervention. Five first-grade students completed the following assessments: Writing Numbers to 120, Adding Fluently to 10, and Place Value. According to our district rubric, two students scored below grade level and three scored above grade level on the baseline.

The data again indicates a positive change on all three assessments. On the Writing Numbers to 120 assessment the two students who were identified as performing

below grade level made a positive change of 2.5. Students identified as below grade level made a positive change of 3 on the Adding Fluently to 10 assessment and also made a positive change of 3 on the Place Value assessment. Due to the fact that the first-grade students who performed above grade level had already scored at the top of the rubric on the baseline assessment there was once again no change on all three assessments given.

Table 2

Baseline Summative First Grade

		Write Numbers to 120			Adding Fluently to 10			Place Value		
		B	S	C	B	S	C	B	S	C
Below Level	Student 1	0.5	1.5	+1	0.5	2	+1.5	0.5	1.5	+1
	Student 2	0.5	2	+1.5	0.5	2	+1.5	0.5	2	+1.5
Above Level	Student 8	3	3	0	3	3	0	4	4	0
	Student 9	3	3	0	3	3	0	3.5	4	+0.5
	Student 10	3	3	0	3	3	0	4	4	0
Change totals				+2.5			+3			+3

Note. B = Baseline, S = Summative, C = Change
3.5-4 = Above Grade Level, 3 = At Grade Level, 1.5-2.5 = Progressing, 0.5-1 = Below Grade Level

AimsWeb progress monitoring was administered as our second source of data collection. This assessment was given once a week as a progress monitoring tool. We chose to only report on the baseline and summative percentile scores because we wanted to narrow down our data.

Kindergarten students who were identified as below grade level were progress monitored on the AimsWeb Oral Counting assessment. Students were given one minute to count as high as they could. According to the protocol, we were able to tell the student one number during the assessment if they got stuck while counting. This progress monitoring probe is the lowest skill level assessed by the AimsWeb program. We chose

this probe because these students need to master this skill level before they can move on to higher level mathematics skills. Every student who was given this assessment showed a positive rate of growth. Students together showed a combined rate of growth of 58. This data is reported in Table 3.

Table 3

AimsWeb

Oral Counting			
	B Percentile	S Percentile	C
Student 3	9	11	+2
Student 4	33	50	+17
Student 5	12	38	+26
Student 6	4	14	+10
Student 7	20	23	+3
Change Totals			+58

Note. B = Baseline, S = Summative, C = Change

Kindergarten students who were identified as above grade level were progress monitored on the AimsWeb first-grade Mathematics Computation (M-Comp) assessment. In this assessment, students were given an eight minute time period to complete various single-digit and double-digit addition and subtraction problems. There were 28 problems to solve. We chose this progress monitoring probe for these two students because this is the skill that these students are working towards mastery on. Both showed a positive rate of growth, together the overall change was a positive 8. This data is reported in Table 4.

Table 4

AimsWeb

1st Grade M-COMP			
	B Percentile	S Percentile	C
Student 11	96	98	+2
Student 12	87	93	+6
Change Totals			+8

Note. B = Baseline, S = Summative, C = Change

First-grade students who were identified as performing below grade level were progress monitored on the AimsWeb Missing Numbers assessment. This probe assesses the student's knowledge of number placement and needs to be mastered in order for the students to progress to the next skill level. Students were given sets of three numbers in sequential order with one of the numbers missing in each set. They were asked to identify what the missing number was. They were given one minute to complete this assessment. Students in this group showed a large rate of growth throughout the four week period with an overall positive rate of change of 47. Table 5 shows this data.

Table 5

AimsWeb

Missing Numbers			
	B Percentile	S Percentile	C
Student 1	49	73	+24
Student 2	57	80	+23
Change Totals			+47

Note. B = Baseline, S = Summative, C = Change

First-grade students who were identified as performing above grade level were asked to complete the second-grade Aims Web Mathematics Concepts and Applications (M-CAP) progress monitoring assessment. This probe assessed students on a variety of

higher level mathematical skills and concepts such as graphing, measurement, money, and early geometry concepts. The students were given eight minutes to complete 29 problems on the assessment. These students showed a rate of growth of a positive change of 31. This data is represented in Table 6.

Table 6

AimsWeb

2nd Grade M-CAP

	B Percentile	S Percentile	C
Student 8	69	95	+26
Student 9	77	80	+3
Student 10	94	96	+2
Change Totals			+31

Note. B = Baseline, S = Summative, C = Change

After the four-week time period, we compared all the baseline and summative scores from the AimsWeb assessments. The information included in this graph shows the participating students growth during this time period. The data shows a positive rate of growth for all students who participated. This data is represented in Figure 1.

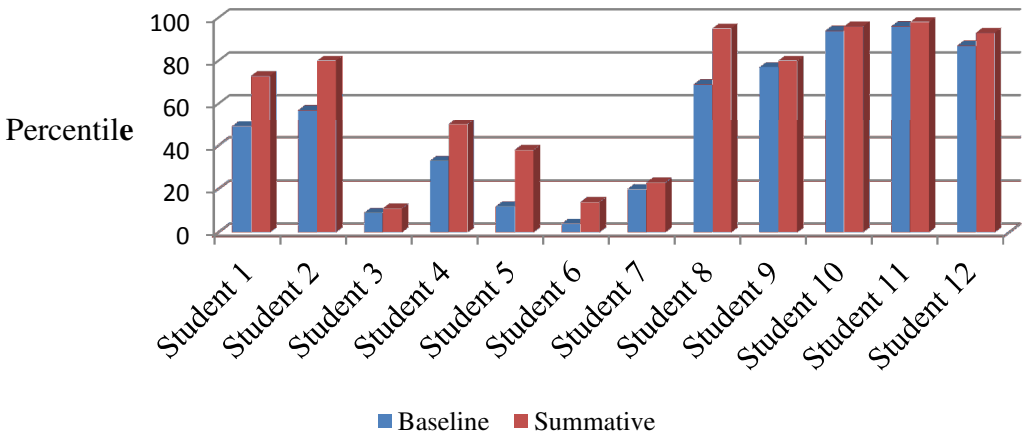

Figure 1. AimsWeb Baseline and Summative Assessment Scores

The next data source analyzed was an iReady student conference form. We needed to know what students' attitudes were toward using the iReady intervention. Specifically, we wanted to know if students liked using iReady, if they felt they were getting better at mathematic skills by using iReady, and if they would like more time to work on the iReady intervention. Students were provided with a Likert scale of answer options that included a smiley face which meant "a lot", a straight face meaning "OK", and a sad face which meant "not at all". We met with students to complete the conference form in the middle and again at the end of the intervention period. There were no "not at all" responses and only 6 "OK" responses. The results of the conference data are noted in Table 7.

Table 7

iReady Student Conference Form

		I like using iReady			I feel I am getting better at Math by using iReady			I would like more time to work on iReady		
		B	F	C	B	F	C	B	F	C
Below Level	Student 1	3	3	0	3	3	0	3	3	0
	Student 2	3	3	0	3	3	0	3	3	0
	Student 3	3	3	0	3	3	0	3	3	0
	Student 4	3	3	0	2	3	+1	2	3	+1
	Student 5	3	3	0	3	3	0	3	3	0
	Student 6	3	2	-1	3	3	0	3	3	0
	Student 7	3	3	0	3	3	0	3	3	0
Above Level	Student 8	3	3	0	2	3	+1	3	3	0
	Student 9	3	3	0	2	2	0	3	3	0
	Student 10	3	3	0	2	3	+1	3	3	0
	Student 11	3	3	0	3	3	0	3	3	0
	Student 12	3	3	0	3	3	0	3	3	0
Change totals				-1			+3			+1

Note. B = Baseline, F = Final Survey, C = Change
3 = A Lot, 2 = OK, 1 = Not At All

On the bottom of our conference form we asked students additional questions to be able to get a better understanding of their attitude towards the iReady intervention program. The first question students were asked was: *What was the best thing about using iReady?* After analyzing the responses we concluded that all students thought the best part of the program was that they were able to be on the computer and play a game after completing each lesson. *Is there anything you didn't like about using iReady?* was the second question students were asked. The lower level students did not have any negative comments about using iReady, but a few of the higher level students said the lessons were too easy for them. The third question was: *Would you rather learn math skills by using blocks, worksheets, games, or iReady?* The majority of the students enjoyed practicing math skills using iReady. Two of the Kindergarten students said they would rather use blocks. We noticed that those students did not have the technology skills needed to navigate the site without teacher assistance. Through our teacher observations, we also noted that these students preferred hands on learning opportunities in all areas of their learning. The last question was: *Is there anything else you would like to tell me about using iReady?* The majority of the students did not make any additional comments.

Our final pieces of data collection were the student behavior observation journals. The observation pieces included the data indicating whether or not students wanted to use iReady and fidelity to the program (if they completed the lessons each day). Eight of the students wanted to use iReady every time and four of the students indicated three or four times they did not want to use the program. According to our journals, the majority of students who wanted to use iReady every time made comments such as, "It is like a video

game" and "I hope I get to play the spaceship game". The four students who occasionally said "no" to using iReady gave reasons that were based on outside factors and were not a reflection of the program. One of the kindergarten students did not want to use iReady because she was upset about missing rest time and once her time on the computer was switched, she was happy to complete the program each day. Three of the above level students in the first grade were introduced to new online mathematic games and occasionally asked to play those instead of iReady. These results are displayed in Table 8.

Table 8

Student Behavior Observation/Journal

Student wanted to use iReady
Totals

Session:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Y	N
Student 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 4	Y	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14	3
Student 5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 8	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	14	3
Student 9	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	14	3
Student 10	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	13	4
Student 11	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 12	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
																	Total	191	13

Note. Y=Yes, N=No

As part of our observation journal we also recorded if students finished the lesson they were working on throughout the 17 documented lessons in order to keep track of fidelity to the program. The results displayed in Table 9 show that half of the students were not able to finish lessons due to the computers not functioning properly and unexpected interruptions during the given time period. Some of the technology

complications included losing internet connections and the computer functions freezing. The remaining six students completed the entire lesson during every iReady session. This was due to the fact that the kindergarten teachers were able to sit next to these students and remedy any computer complications.

Table 9

Student Behavior Observation/Journal

Student finished iReady lesson
Totals

Session:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Y	N
Student 1	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	15	2
Student 2	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	14	3
Student 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 8	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	14	3
Student 9	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	13	4
Student 10	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	14	3
Student 11	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	17	0
Student 12	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	16	1
																	Total	188	16

Note. Y=Yes, N=No

In conclusion, the goal of this action research was to determine the effectiveness of the iReady mathematics intervention program on student achievement for both above and below level students. Our observations and data support that this intervention was successful for both groups. However the data leads us to believe the students who benefited the most were those who were performing below grade level. The difference in growth can be partly due to the fact that these students were exposed to a greater amount of new mathematic skills that they had not yet mastered. We noticed that the diagnostic assessment did not place the above level students at an appropriate skill level. Therefore

their lessons did not expose them to challenging enough material at their instructional level.

In the next section we will describe our response to the results of the action research. We will outline the action steps that we will take as a result of our data. We will also address questions that arose and explore the ideas for future action research.

Action Plan

As classroom teachers we noticed a need for mathematics interventions in our district. We were wondering if there was an intervention program that would be able to both support students who were performing below grade level and to challenge students performing above grade level. After reviewing different mathematics interventions, we chose to research and implement the iReady intervention program. Our data showed that the use of iReady had a positive impact on student achievement. Therefore, we feel iReady is a useful mathematics intervention we will continue to use, but we may need to make alterations in order to make it more successful. We also have additional questions to be answered and investigated.

After analyzing our data from the above level students we feel they were not given the opportunity to be exposed to material at their instructional level. Many of the lessons taught skills that these students had already mastered. However, upon teacher observation, we noticed these students were progressing through the lessons quicker than the lower achieving students and we wondered how soon they would be introduced to new material if they continued with the program. For this reason, we plan to have the above level students continue using iReady to see if it can eventually meet their instructional needs. If after another four week intervention period, the program does not

meet the students' instructional level we would then choose a new intervention plan to challenge them.

Another question we had concerning the above level students was whether or not we could manually adjust the iReady program skill level to better meet their instructional needs. When we originally investigated this program we found that it was a K-12 Common Core aligned intervention tool. The iReady website stated that this program "provides rigorous, on-grade-level instruction and practice" (Curriculum Associates, LLC, 2013, para. 3). For this reason we know the program contains higher level materials our above level students would benefit from. As a next step, we plan on researching if we are able to move students to higher skill levels, if the program doesn't advance them fast enough.

While analyzing the baseline and summative assessment data we found that the higher-achieving students were making growth in mathematics achievement, but these assessments did not show their growth. Some of the baseline/summative assessments our district uses do not have the option of showing an advanced level. Students performing above grade level are capping out at the top of the assessment by scoring a 3 (which means "at grade level") already on the baseline and some of them were even reaching the 4 on the grade level assessments that assessed higher skills. We would like to research what assessments would be better able to show growth for our high achieving students. One idea we would like to explore is using the next grade level's assessments. For example, if a kindergarten student has all 3's on their baseline, then the teacher would use the first-grade assessment for that standard to progress monitor and assess the student.

We would like to continue using iReady for both groups of students because we felt the intervention period was too short. In our district the typical intervention period is approximately six to eight weeks. The intervention period for this action research project was only four weeks in length. We question if our student achievement would show a higher rate of growth if the intervention period had been longer.

Overall, the students enjoyed using the iReady intervention program. The positive feedback from the students, along with the increase in student achievement in the area of mathematics, leads us to believe that we should continue using the iReady intervention tool. We would like to conduct further action research to find out if another type of mathematics intervention program would benefit our students more than iReady. We would love to compare the results of a different program to the results we received from using iReady. We would also like to conduct further action research to learn more about the typical rate of growth for students who are performing above grade level in mathematics.

In conclusion, we have found the effectiveness of the iReady mathematics intervention to be significant in improving mathematics achievement. We believe the longer our students are on the iReady intervention program, the higher increase we will see in student achievement for both the below grade level students and for those performing above grade level.

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Appendix A

Counting to 100 (Baseline/Summative)

K.CC.1

Performance Task: Counts to 100 by ones and tens **INDIVIDUAL**

Learning Target: **K.CC.1** Counts to 100 by ones and by 10's.

Materials: **None**

Procedure: **Ask the student to "count as high as they can starting with number 1."**

Record the last number that was correctly counted

Procedure: **Ask the student to "count by 10s as high as they can."**

Record the last 10s number that was correctly counted

I Can Statement: *I can count (out loud) to 100 by ones and by tens.*

Appendix B

Name Numbers 1 – 20 (Baseline/Summative)

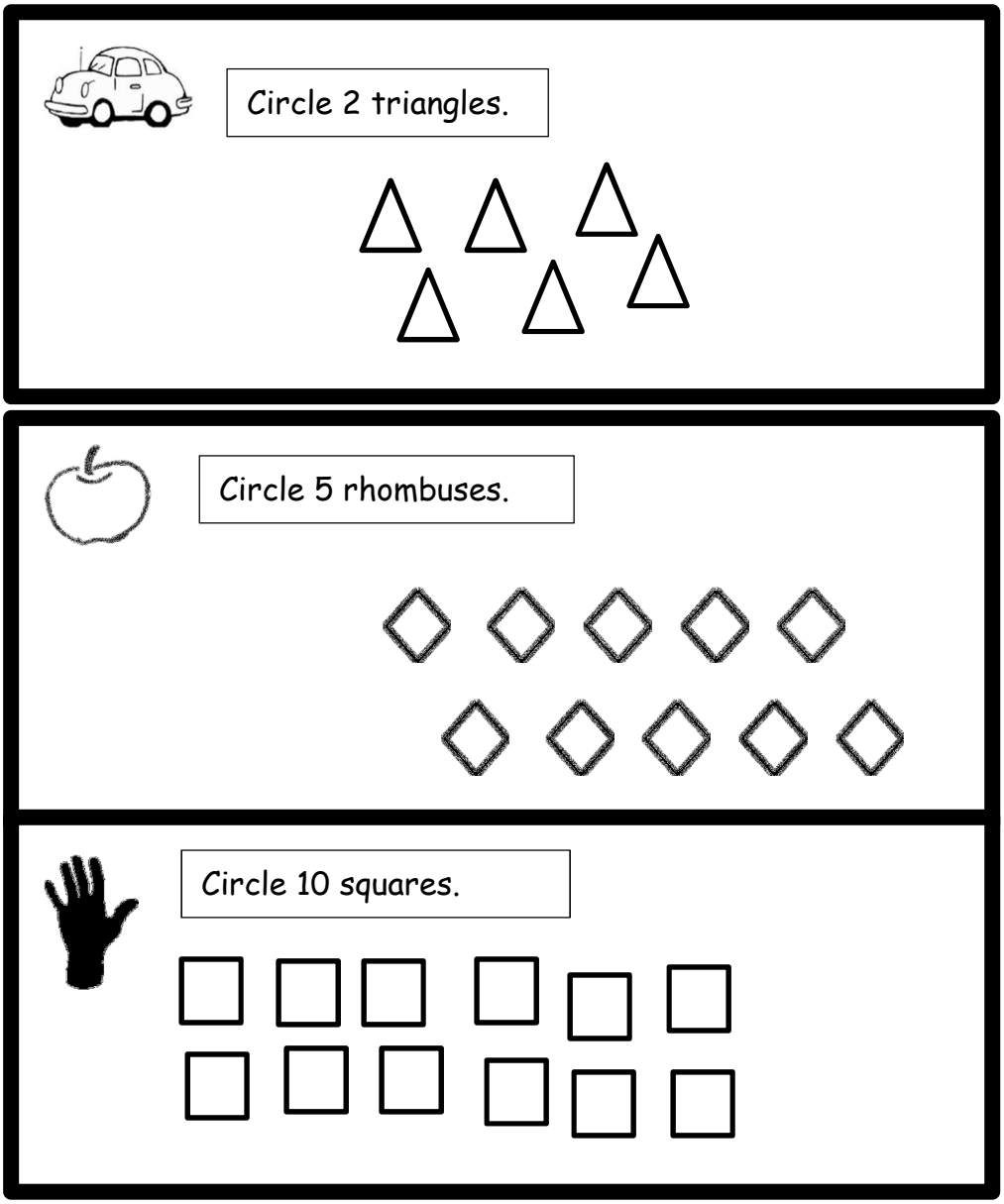
8	2	10	5	7
1	4	9	3	6
15	12	13	11	14
19	17	20	16	18

Appendix C

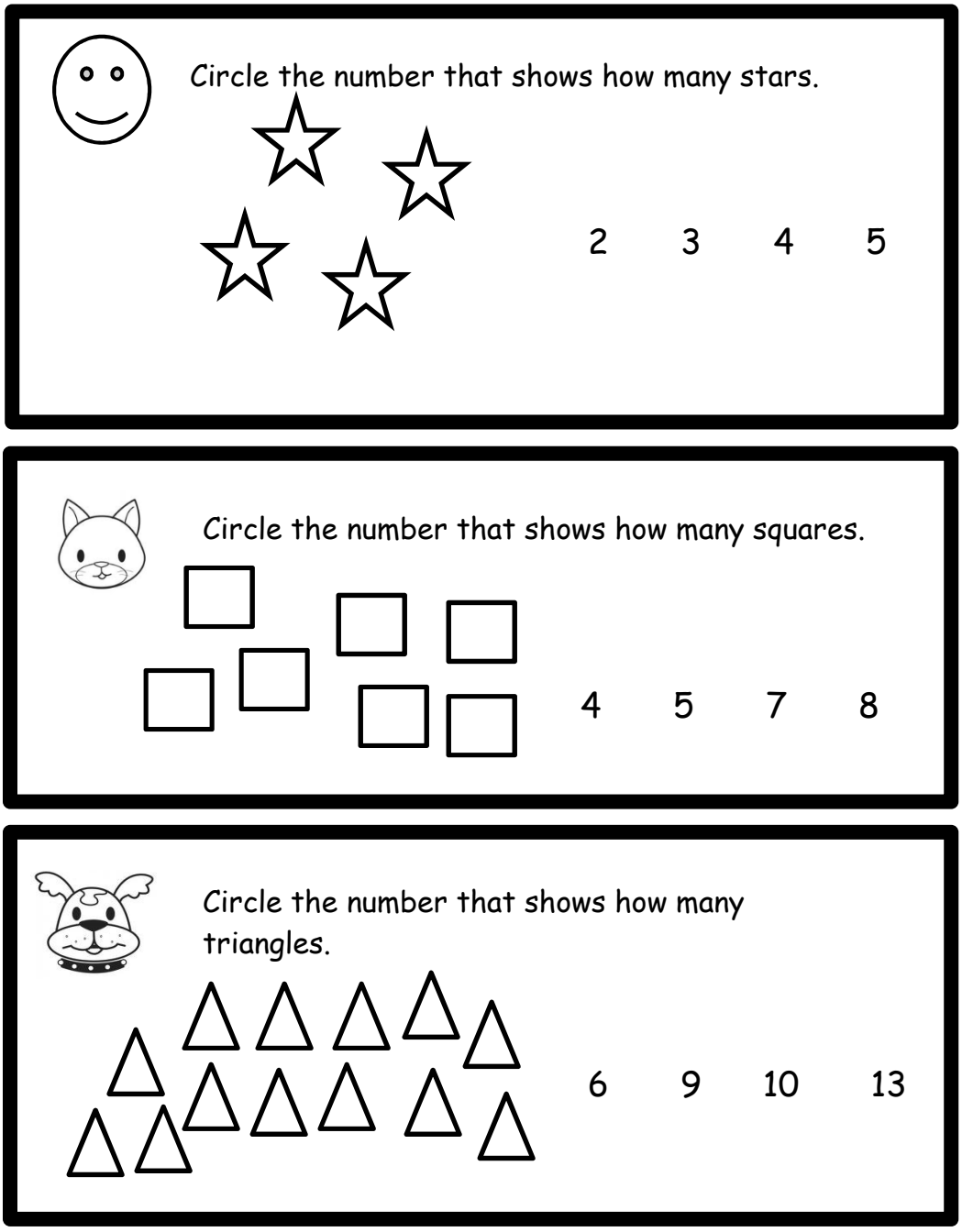
Quantities Assessment (Baseline/Summative)

K.CC.5 I can count to answer "how many?" questions for as many as 20 things.

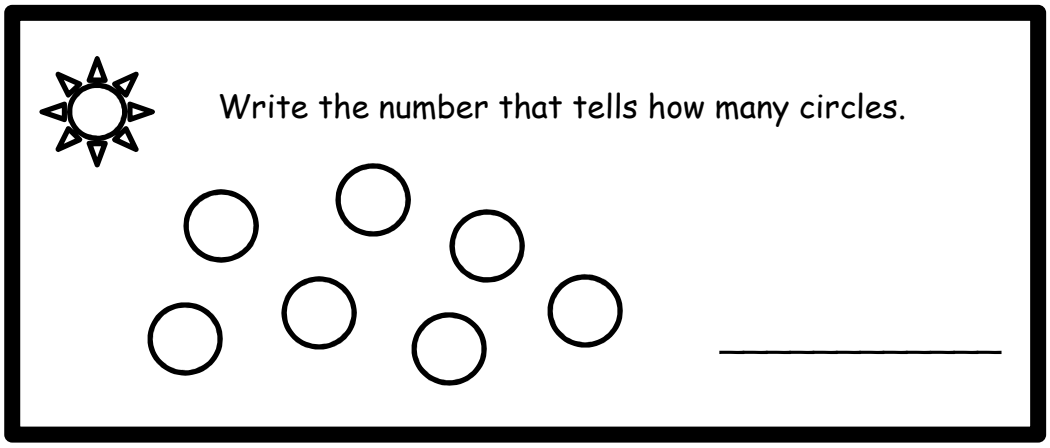
(Page 1 of 3- BOY Trigger #3) CREATES A SET TO REPRESENT A QUANTITY

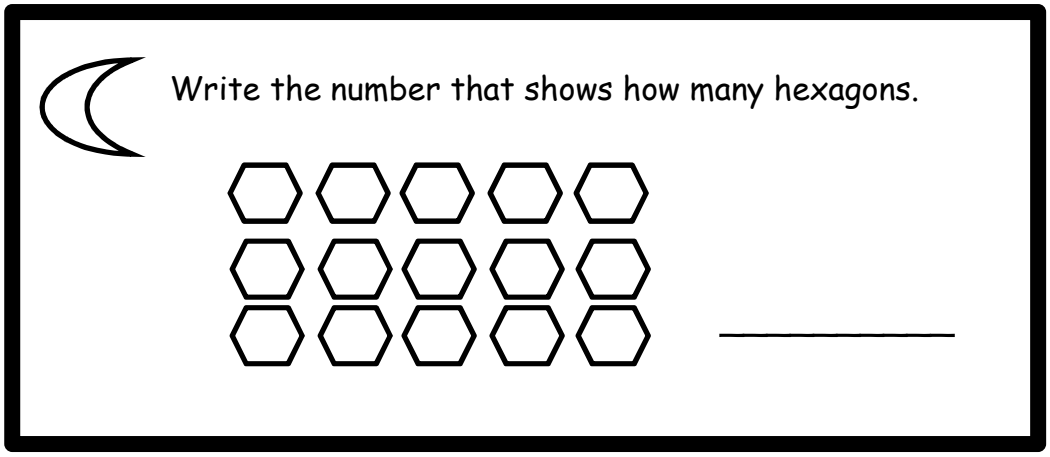


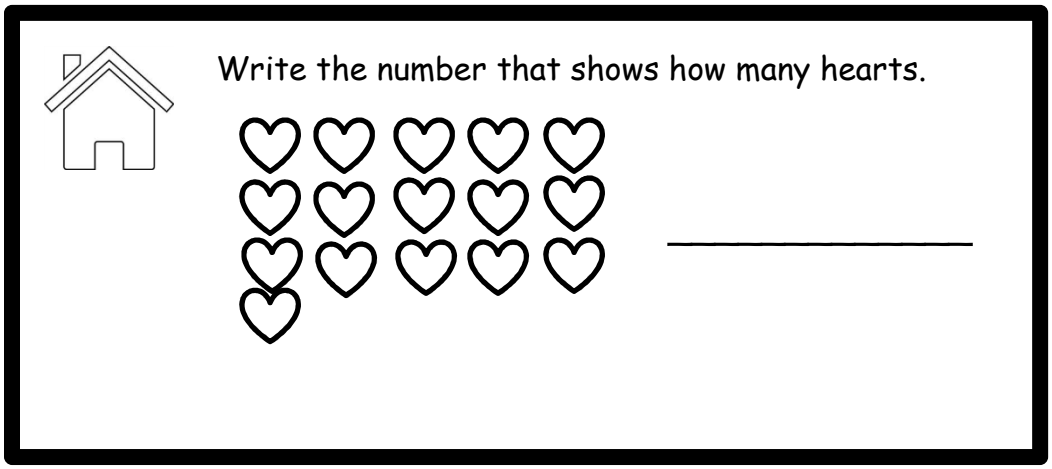
(Page 2 of 3) MATCH A NUMERAL TO A QUANTITY



(Page 3 of 3) WRITES A NUMBER TO REPRESENT A QUANTITY







Appendix D

Counting to 120 Assessment (Baseline/Summative)- Part A

Complete each number strip by filling in the missing numbers.

24	67	90	113
25	68	91	114

Counting to 120 Assessment (Baseline/Summative) – Part B

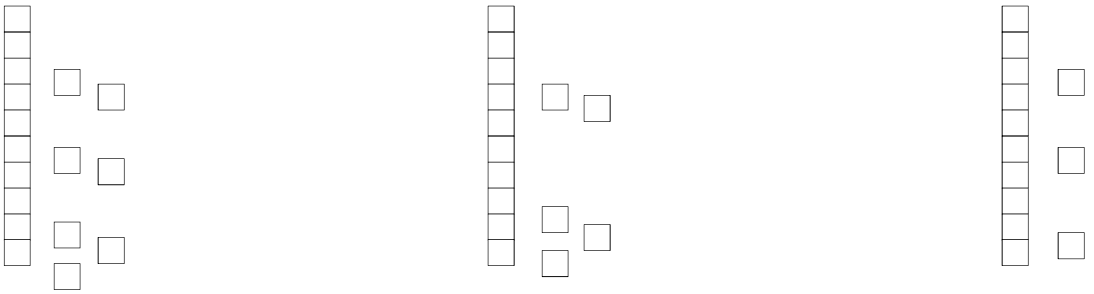
Write numbers from 1 – 120 in sequential order.

Appendix E

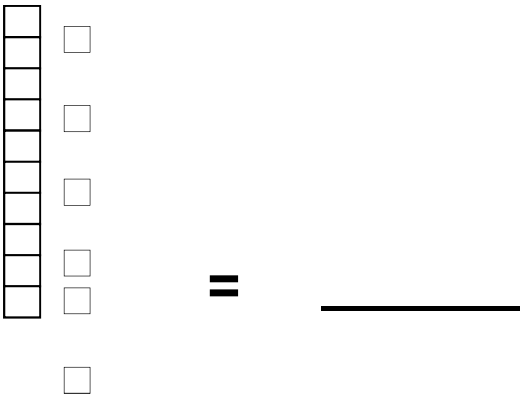
Place Value Assessment (Baseline/Summative)

SKILL SET A

1. Circle the picture that shows 1 ten and 7 ones.



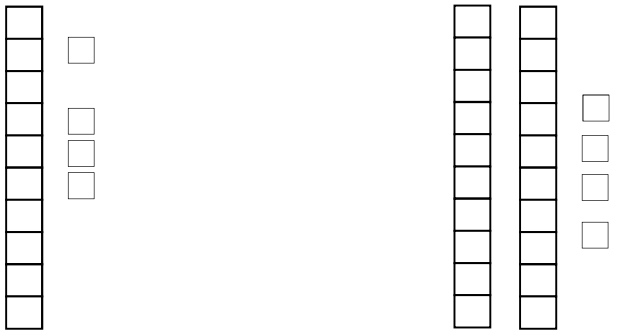
2. Write the number the base ten blocks show.



= _____

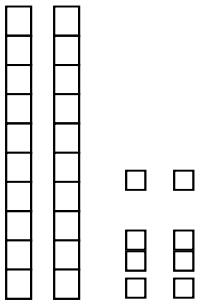
3. Circle the base ten blocks picture that shows the number.

14



SKILL SET B

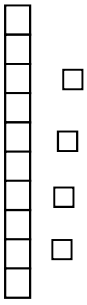
4. Write how many tens and ones the blocks show.

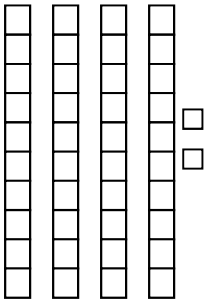


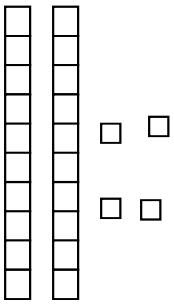
= ____ tens ____ ones

---

5. Circle the picture that shows 4 tens and 2 ones .







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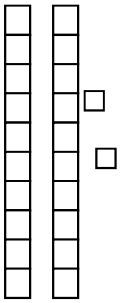
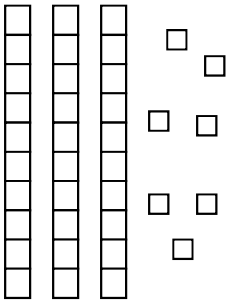
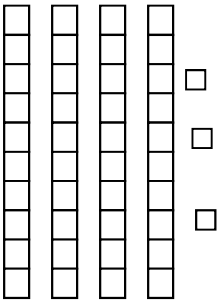
6. Circle the picture that shows 37 .







SKILL SET C

7. Look at the number. 49

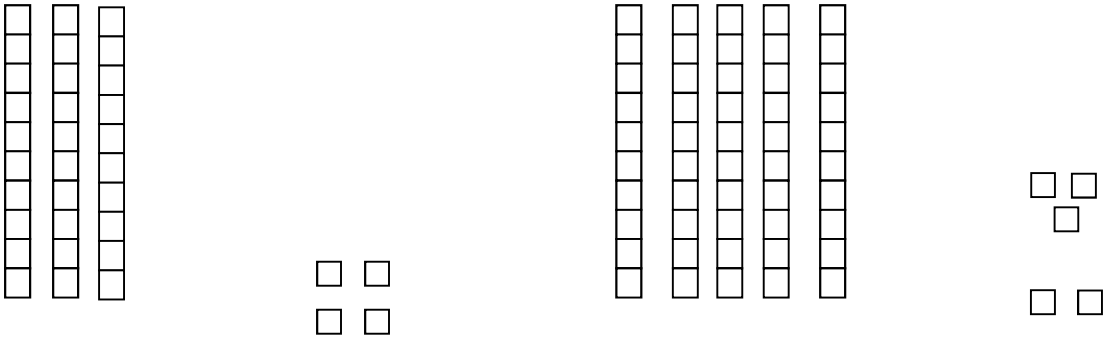
Which digit is in the tens' place? _____

Which digit is in the ones' place? _____

8. How many tens are in 62 ? _____

How many ones are in 62 ? _____

9. Circle the picture that shows what the 5 means in 54?



Appendix F

Addition Facts Assessment (Baseline/Summative)

Student Name_____

Summative Assessment – Sums to 10

Fact	Baseline	CFA	CFA	CFA	CFA	CFA	EOY
7+1							
9+1							
1+8							
6+1							
1+5							
7+2							
4+2							
2+5							
8+2							
6+2							
4+4							
3+3							
5+5							
6+0							
0+9							
0+8							
3+4							
7+3							
5+3							
3+6							
4+5							
6+4							
SCORE	/22	/22	/22	/22	/22	/22	/22
PERCENT	%	%	%	%	%	%	%

Bismarck Public Schools 2014-2015 1st Grade Progress Report Assessment

Appendix G

Example of a Bismarck Public School's Rubric

<table>
<tr><td colspan="3">Domain: Number and Operations in Base Ten</td></tr>
<tr><td colspan="3">Cluster: Extend the Counting Sequence</td></tr>
<tr><td colspan="3">1.NBT.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.</td></tr>
<tr><td colspan="3">Grade 1</td></tr>
<tr><td>Score

4.0</td><td colspan="2">Count within 1000, skip-count by 5s, 10s, and 100s. (Aligns with 2.NBT.2)

Student is able to complete all grade level counting sequences without errors, including the Advanced sequences.</td></tr>
<tr><td></td><td>3.5</td><td>No errors or omissions regarding 3.0 content and partial knowledge of the 4.0 content</td></tr>
<tr><td>3.0</td><td colspan="2">Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number objects with a written numeral.</td></tr>
<tr><td></td><td>2.5</td><td>No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content</td></tr>
<tr><td>2.0</td><td colspan="2">Count numbers to 120, starting with any number less than 120.
• Student correctly completes 2 out of 4 counting sequences (written).
and,
Write numbers to 120, starting with any number less than 120.</td></tr>
<tr><td></td><td>1.5</td><td>Partial knowledge of the 2.0 and/or 3.0 content but no major errors or omissions regarding the 1.0 content</td></tr>
<tr><td>1.0</td><td colspan="2">Count numbers to 120, starting with any number less than 120.

• Student can complete all 3 oral counting sequences (Sequences to 100)</td></tr>
<tr><td></td><td>0.5</td><td>No understanding or limited skill is demonstrated.</td></tr>
</table>

***Note:** Scores of **0.5 – 2.5** are below grade level, a score of **3.0** is on grade level, and scores of **3.5 – 4.0** are above grade level

Appendix H

AIMSweb® Oral Counting – Progress Monitor Assessment

Given To: _____ **Given By:** _____ **Date:** _____

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Appendix I

AIMSweb Math Computation

Student: Teacher: Date:

1 $7 + 0$	2 $5 + 3$	3 $4 + 9$
4 $2 + 6$	5 $1 - 0$	6 $1 + 4$
7 $10 + 6$	8 $6 + 8$	9 $10 + 3$
10 $4 + 7$	11 $5 + 5$	12 $6 - 0$
13 $9 - 8$	14 $0 + 3$	15 $30 + 14$

AIMSweb® Math Computation
2 3 4 5 6 7 8 9 10 11 12 B C D E

Progress Monitor Grade 1, Probe 4, Page 1

Appendix J

AIMSweb® Missing Number - Progress Monitor Assessment #4

Given To: _____ Given By: _____ Date: _____

_ 11 12	15 _ 17	7 _ 9	/ 3 (3)
5 _ 7	_ 5 6	_ 9 10	/ 3 (6)
17 _ 19	17 18 _	_ 12 13	/ 3 (9)
_ 7 8	3 4 _	14 15 _	/ 3 (12)
_ 14 15	9 10 _	13 14 _	/ 3 (15)
13 _ 15	_ 1 2	6 _ 8	/ 3 (18)
_ 2 3	10 _ 12	_ 17 18	/ 3 (21)
11 _ 13	0 1 _	_ 13 14	/ 3 (24)
16 _ 18	_ 18 19	_ 19 20	/ 3 (27)
7 8 _	_ 15 16	3 _ 5	/ 3 (30)

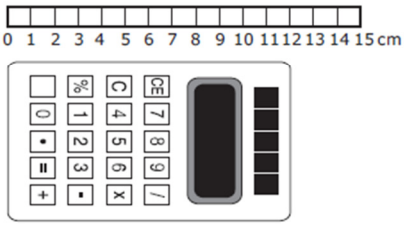
____/____

Appendix K

AIMSweb Math Concepts and Applications

Student: Teacher: Date:

1 How long is the calculator?



_____ cm

2 Write the answer in each blank.

Of these numbers

711 493 108 536

_____ is the smallest

_____ is the largest

3 What is the height of the bottle?

_____ in.

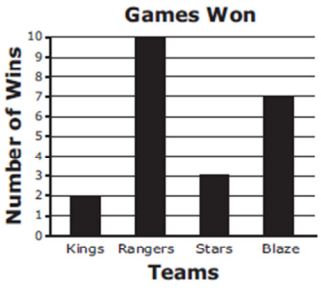
4 Adam drew 11 birds and Joe drew 7 birds. How many birds did Adam and Joe draw in all?

_____

5 Write the answer in the blank.

9 + 3 + 14 = _____

6 Use the graph to answer the question.



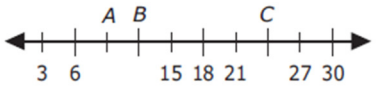
How many games did the Stars win?

_____

7 Write + or − in the blank.

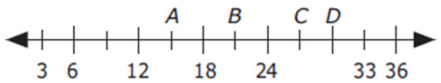
15 _____ 7 = 22

8



What number does *A* stand for?

_____



What number does *B* stand for?

_____

Student: Teacher: Date:

9 Counting by 4s, fill in the blanks.

24, 28, 32, _____ , _____

10 A bag contains 10 bagels. Two of them are eaten. How many bagels are left in the bag?

_____

11 How much money is pictured below?

_____ ¢

12 Write the answer in each blank.

Of these numbers

187 196 149 150

187 is greater than _____ and _____

13 Write the time.

_____ : _____

14 Starting with the number *0* and counting left to right,

0	2	4	6	8	10	12
14	16	18	20	22	24	26
28	30	32	34	36	38	40

write the fourth number _____

write the ninth number _____

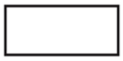
write the third number _____

15 Write + or − in the blank.

59 _____ 13 = 46

16 Which shape below is a rectangle?

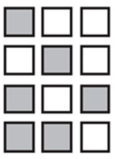
A 

B 

C 

_____

17 What fraction of the boxes is shaded? Write the fraction in the blank.



_____

Student: Teacher: Date:

18 Fill in the blanks.

726 = ____ hundreds ____ tens ____ ones

19 How much money is pictured below?

$_____

20 Write "less" or "greater" in the blank.

597 is _____ than 841

21 Starting with the letter *A* and counting left to right,

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O

write the third letter _____

write the sixth letter _____

write the eighth letter _____

22 Fill in the blanks.

873 = ____ hundreds ____ tens ____ ones

23 It took Carla 15 minutes to walk to school. It took Ken 25 minutes to walk to school. How many more minutes did it take Ken to walk to school than Carla?

_____

24 Write the answer in the blank.

_____ = Three hundreds three tens two ones

25 Alex has 12 pieces of candy and Melinda has 18 pieces of candy. How many more pieces of candy does Melinda have than Alex?

_____

26 Write the time.

_____ : _____

27 Ken has 16 slices of pizza to share equally among 8 classmates. How many slices of pizza will each classmate get?

_____

Student: Teacher: Date:

28 What fraction of the stars is shaded?
Write the fraction in the blank.

_____

29 Write the answer in the blank.

What number is 190 more than 250?

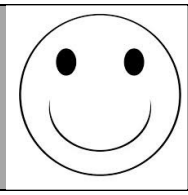
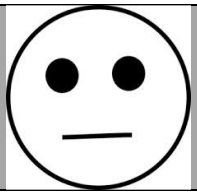
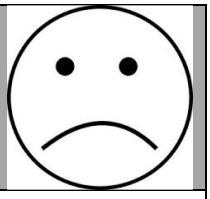
_____

Appendix L

iReady Student Conference Form

Name _____**Grade**_____

Please answer the questions below by placing an X in the box of your choice.

				
1.	**I like using iReady.**			
2.	**I feel I am getting better at Math by using iReady.**			
3.	**I would like more time to work on iReady.**			

1. **What was the best thing about using iReady?**

2. **Is there anything you didn't like about using iReady?**

3. **Would you rather learn math skills by using blocks, worksheets, games or iReady?**

4. **Is there anything else you would like to tell me about using iReady?**

Appendix M

iReady Teacher Observational Checklist

Teacher _____ **Grade**_____

Student Name _____

Student I.D. _____

Date	Did the student want to use iReady?		Student finished iReady lesson.		Notes
	Yes	No	Yes	No	