The Effects of the IXL Computer Program on Fourth Graders’ Mathematic Achievement Levels

Kristi J. Marbury

Southeastern Louisiana University
Abstract

The purpose of this study is to investigate the effectiveness of the IXL Computer Program on fourth grade students’ mathematic achievement levels. A small group of five to six fourth grade students identified as at-risk for mathematics will participate in this study using a mixed methods design. The AIMSweb Curriculum-Based Measurement Math Probes and the Ascension Parish Benchmark Exam will be administered prior to and after treatment to determine achievement levels.
Purpose Statement

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Introduction

As a teacher, I am a continual learner, believing in teamwork, and working effectively with other teachers at my school. Adoption of the Common Core Curriculum by Ascension Parish has greatly influenced teachers to implement technology-rich teaching methodology where the teachers and the students are engaged in active dialogue, group work, and discussions. With professional learning communities (PLCs), teachers at Spanish Lake Primary can work together to find best practices to incorporate the IXL program and use it to its fullest potential. One of my roles will be to assist teachers in using the IXL program effectively for assessing student learning, differentiating instruction, and providing engaging learning experiences.

Spanish Lake Primary School first opened its doors in August 2009. It is located in the rural area of Geismar, Louisiana where enrollment is approximately 850 students and forty-eight teachers for grades kindergarten through fifth. Thirty-six percent of the students receive free or reduced lunch, and special education students comprise about thirteen percent of the school’s population. In 2014, Spanish Lake Primary School ranked better than eighty-six percent of elementary schools in Louisiana. The average math score was eighty-nine percent, and the average reading score was eighty-four percent.

Adoption of the Common Core Curriculum by Ascension Parish has greatly influenced teachers to implement technology-rich teaching methodology where the teachers and the students are engaged in active dialogue, group work, and discussions. The Common Core State Standards include
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Instructional shifts that incorporate a greater use of technology in all content areas across all grade levels. A specific example of this at the primary level is Anchor Standard 6 in Writing for grades K through 5. The standard states, “Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.” This is just one example of the many standards designed to promote a foundation for college and career readiness.

With all of the new mandates given to teachers recently, it is possible that learning ways to implement technology into their lessons is not one of their priorities. However, with CCSS and Compass, technology-rich lessons are a must to give quality learning opportunities for our students.

The principal and assistant principal at Spanish Lake Primary are supportive and provide consistent feedback to teachers regarding their professional duties. They are visible daily on our school campus, and they interact with students often. The other fourth grade math teacher with whom I plan is an excellent person to discuss ideas and reflect with during our PLC time.

According to Merriam-Webster Learner’s Dictionary, a paradigm shift is defined as an important change that happens when the usual way of thinking about or doing something is replaced by a new and different way. Adoption of the Common Core requires teachers to perhaps change some of their current attitudes and/or beliefs. For some teachers at Spanish Lake Primary this may prove difficult, but hopefully the comfortable PLC setting will provide for a smoother transition.

Spanish Lake Primary currently houses approximately 300 computers for use by our 850 students, which calculates to just under a three to one student-computer ratio. Although to many that ratio sounds promising, when you look closely, it is not evident that there are three students per every computer during each school day. Four desktops are housed in each classroom, and the laptops are either being used in the computer lab or through a mobile cart one class at a time,
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therefore limiting actual student usage. There is a need for more laptops available for student use in order for teachers better align their lessons to the Common Core State Standards.

**Review of Literature**

Technology is steadily becoming an increasingly important and integral part of classroom instruction at all levels. The Common Core State Standards Initiative and Standards for Mathematical Practice support a constructivist approach to education requiring students to problem solve, think critically, apply knowledge rather than just recall it, and analyze results (Cornelius, 2011). An overarching theme found in research done on computer-based programs’ effects on learning practices and student achievement is that a blended program is better than a one-size fits all approach. A blended classroom is student centered, consists of the teacher as a facilitator, and a technology rich environment (Beck-Hill & Rosen, 2012).

The National Education Technology Plan promotes meaningful and valuable learning experiences that will enable students to succeed in a global networked society (Beck-Hill & Rosen, 2012). Today, most careers incorporate or require applicants to have skills learned in multimedia disciplines (Cornelius, 2011). Unfortunately, there seems to be a divide between the level of Career and Technical Education (CTE) instruction and teaching in other content areas, especially in mathematics (Often, 2011). American fourth and eighth-graders trail far behind their counterparts from other countries in mathematics. With critical thinking being so crucial for careers in the fields of Science, Technology, Engineering, and Math (STEM), teachers are focused on improving math achievement levels.

Algebra seems to be the gateway to success for future mathematical skills in school and in today’s job market (Oishi, 2011). By the time some students reach high school algebra, they have been struggling with math for an extended period of time. This struggle might revert all the
way to elementary school. When students fail or experience frustration with math over several years, they may begin to think that they are just not good in math. Parents can sometimes add to this negative thinking by telling their children that they were not good in math either, almost as if it is to be expected. The National Council for Teaching Mathematics (NCTM) strongly recommends that schools provide curriculums that are rich in algebraic thinking, concepts and skills from the earliest elementary grades. Many software programs use adaptive learning technology which evaluates students’ knowledge and individualizes instruction. These programs blended with classrooms that encourage collaboration, problem solving and a continuum of mathematical discussions may lead to an avenue of improving algebra education (Oishi, 2011).

Many educational software programs, such as Khan Academy, provide prescriptive interventions, real-time data and feedback to individual students, empowering them with a sense of ownership of their learning. While many of these computer programs may be differentiated based on students’ needs, they do not always promote inquiry, mathematical thinking or open ended questions (Shaffhauser, 2013). One possible solution to this downfall could be for teachers to create their own videos which would allow for connections to previous learning experiences specific to their classrooms, while also showing the students and parents their thought process while working through a problem (Fulton, 2012).

One online tutoring program that does profess to promote true conceptual understanding of mathematical ideas is 4MALITY, which provides virtual coaches to assist students with problems. Another positive aspect of 4MALITY is its ability to address common student misconceptions and confusing language within a problem (Anderson, Maloy, & Edwards, 2010).

Today’s teachers must consider Information and communication technologies (ICT) when designing their classrooms. ICT may include programs where students play games to
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enhance their mathematical skills. Some studies report computer games as having a positive
impact on children’s cognitive development (Bulut & Delen, 2011). In a study done by Kim and
Chang (2010), ELL students who played daily computer games performed higher in math than
English speaking students who did the same.

According to the Common Core State Standards for Mathematics (CCSSM), fluency can
be described as either procedural fluency or basic fact fluency. Currently, many assessments
providing data on a student’s basic fact fluency are timed and offer little insight about the
student’s use of strategies when solving these facts (Kling and Williams, 2014). One study
examining the effects of a computer-based math facts fluency (CBMF) program showed that the
computer-based interventions increased students’ math skills. However, what the study did not
provide was details about how the students scored in the areas of problem solving and critical
thinking (Burns, Kanive, & DeGrande, 2012).

Hypothesis

It is hypothesized that there will be a statistically significant difference in mathematic
achievement levels among fourth grade students after using the IXL Program.

Operational Definitions

Statistically significant is defined by Wikipedia as the probability that an effect is not due
to just chance alone. IXL is an interactive technology program which provides comprehensive,
standards-aligned math and language arts practice for K–12 students. IXL motivates students
through interactive games and exercises while keeping teachers and parents informed and
involved with weekly reports. For this study, at-risk students are identified as those scoring
below the 25th percentile on the AIMSweb Curriculum-Based Measurement Math Probe or
scoring below basic on the Ascension Parish Benchmark Exam administered prior to treatment.
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Students’ achievement levels include above average, average, below average, and at-risk based on AIMSweb scores. The Benchmark achievement levels are unsatisfactory, approaching basic, basic, mastery, and advanced. These levels are aligned with the Leap test.

Methodology

Research Design

This study will utilize a mixed methods design. The independent variable is the IXL program, and the levels will include mathematic achievement of at-risk students prior to and after implementation of the program. The dependent variable is mathematic achievement levels. Student achievement levels will be determined using results from the AIMSweb Curriculum-Based Measurement Math Probes and the Ascension Parish Benchmark Exam. The qualitative element will be collected by interviewing students about their experiences with mathematic achievement during the school year and at the end of the study.

Sample

This study will use convenience sampling. The subjects will include five to six at-risk students who are currently struggling with math fluency and problem solving.

Instrumentation

For this study, the AIMSweb Curriculum-Based Measurement Math Probes and the Ascension Parish Benchmark Exam will be administered prior to and after treatment. Each AIMSweb CBM test is an alternate form of equivalent difficulty. Each test consists of 25 math computation problems representing the year-long, grade-level math computation curriculum in exactly the same way using prescriptive methods for constructing the tests. AIMSweb CBM is highly prescriptive and standardized, which ensures reliable and valid scores. Students will be given standardized math probes at regular intervals to produce accurate and meaningful results.
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that will be used to quantify short- and long-term student gains by the end of the study. Probes will be scored for problems correct, and student scores will be graphed for consideration when making decisions about the instructional programs and teaching methods for each student in the study. AIMSweb CBM will provide a doable and technically strong approach for quantifying student progress. AIMSweb CBM Computation will be administered to a group of students at one time, and students will have a set amount of time (eight minutes) to answer the math problems on the Computation test. Timing the CBM Computation test correctly is critical to ensure consistency from test to test.

The Ascension Parish Benchmark Exam consists of twenty-four multiple choice questions and constructed response items. For this study, only the multiple choice section of the quarter one benchmark exam will be used.

Procedure

Five to six fourth grade students scoring at-risk on the AIMSweb CBM test or below basic on the quarter one benchmark exam will participate in this study throughout a nine week period. All of the students will be nine or ten year old Caucasian or African American students who attend Spanish Lake Primary public school. The timeframe for this study will be nine weeks. The students will practice math skills using the IXL computer program three to five times per week. Math skills on the IXL program will be assigned to each student. These skills will be similar to both quarter one math concepts currently being taught in class, and to those items from the AIMSweb CBM tests. Progress monitoring will be done during implementation of the program, which will include weekly detailed printed reports showing each student’s progress on specific skills. The AIMSweb test and the multiple choice section of the quarter one benchmark exam will also be given prior to the treatment phase of the study and at the end of the
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study. The teacher will refer to the teacher prompted directions when administering each AIMSweb test.

Data Analysis

In order to assess the effectiveness of the IXL program, results from the AIMSweb CBM tests and the quarter one benchmark exam will be reported graphically and through a visual comparison of the results obtained prior to and after the treatment phase. The criteria used to evaluate this data will be the presence of student growth from the at-risk category to at minimum the average category on the AIMSweb CBM or an increase in student scores to at minimum the basic level on the benchmark exam. Qualitative data from student interviews will be analyzed to determine emerging trends.

According to the Ascension Parish Technology Plan, the overarching goal is as follows, “In alignment with business and community, all Ascension Parish educators and learners will benefit from technology-rich environments that support student achievement and produce life-long learners able to succeed in an information society.” During time allocated for professional learning communities (PLCs), teachers will acquire more hands-on practice to build confidence when using the IXL program with their students. One of the things addressed by ISTE standard number four (for coaches) is evaluating the impact on instructional practices. PLCs will allow us time to work interdependently to analyze and change professional practices in order to improve our individual and collective results. Having a shared purpose of moving our students forward will guide us in discovering the best practices for using the IXL program by stating strengths, weaknesses, and ideas for future lessons.
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References


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