THE EFFECTS OF PROFESSIONAL GROWTH COURSE ON FIRST GRADE STUDENTS MATH SCORES

By

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ABSTRACT

This study was completed to find if there is a significant difference in math M-COMP scores for students whose teachers did not participate in a Professional Growth Course in mathematics, and for students whose teachers did participate in a Professional Growth Course in mathematics. Different teaching styles for teachers should be considered when developing classroom instruction in mathematics. Different student learning styles should also be considered regarding students taking the M-COMP standardized math test. The outcomes reported from this study show that there is not a significant difference in student achievement as measured by the M-COMP Aims Web Benchmark scores between students taught by teachers who have not taken the Math PGC compared to the teachers who have taken the Math PGC. The reasoning behind this would be the results of the Professional Growth course that was taken by the teachers participating. After compiling and reviewing the findings of this study, current research and literature, and the statistical data from the M-COMP results, it is found that there was not a positive result in student M-COMP scores from 2012 to 2013 in that the Professional Growth Course did not have a positive affect on student outcomes.
INTRODUCTION

Background, Issues and Concerns

This study came about because of the low math scores that were a pattern at the elementary school. The principal noticed that something needed to be done in order to change the way math was being taught at the elementary school. The Midwestern suburban school district was in the process of changing the math being taught and hired a math professor at a nearby university, to help out. The principal the elementary school took things a step further by hiring the math professor to work with the elementary school staff to work on understanding math more in depth, and therefore the Professional Growth Course; Moving Forward With Math, was designed for teachers to be able to teach the students in ways that would be more effective. The course, Moving Forward With Math, allowed the teachers to participate in vertically aligning Common Core State Standards to facilitate the conceptualizing of their own understanding of math. Teachers were able to share their professional development from a previous math training to assist in their math collaboration. A backwards design approach was used as teachers engaged in hands-on math activities to demonstrate understanding of each strand. Vertical participation provided each participant an understanding of the vertical alignment of the Math Common Core Standards.

Practice under Investigation

The practice, which is under investigation, is the math practices and how they have been in the past to teach, compared to how math is currently being taught.

School Policy to be Informed by Study

The policy to be informed is the schools math strategies and tools, which are provided by the school district.
**Conceptual Underpinning**

The course will lead to student achievement, and this research is based on the AIMS Web M-COMP math scores for the first grade, based on the instruction and understanding of mathematics principals that have been altered or changed because of the PGC. The Course will allow teachers the knowledge to teach students mathematics strategies that will lead to higher student achievement. Mathematics scores in the recent years have not been as high as the reading scores that the principal had noticed. Five years ago the entire school took on Readers Workshop, and has seen higher academic achievement because of the work done with Readers Workshop by teachers. The principal now has taken the initiative of this Math PGC course and implementing the practices within the school. The Math PGC is going to affect student achievement in math, which is why the staff at the elementary school is taking the PGC.

**Statement of the Problem**

Low math scores throughout the elementary school.

**Purpose of the Study**

The purpose of this study is to determine whether or not the Mathematics Professional Growth Course, taken by the first grade teachers at the elementary school, has had an effect on the Aims Web Benchmark M-COMP scores for first grade in spring 2012 compared to spring 2013.

**Research Question**

Is there a difference in student achievement as measured by the Aims Web Benchmark M-COMP scores between students taught by teachers who have not taken the Mathematics Professional Growth Course compared to teachers who have taken the Mathematics Professional Growth Course?
Null Hypothesis

There is no difference in student achievement as measured by the Aims Web Benchmark M-COMP scores between students taught by teachers who have not taken the Mathematics Professional Growth Course compared to teachers who have taken the Mathematics Professional Growth Course.

Anticipated Benefits of the Study

The Mathematics Professional Growth Course taken by the first grade teachers at the elementary school has an affect of an increase in overall Aims Web Benchmark M-COMP scores for the first grade in spring 2013, based on the Aims Web Benchmark scores taken from spring 2012.

Definition of Terms

Aims Web Benchmark – An assessment given to students in the fall and in the spring semesters in order to measure math achievement.

M-COMP - Mathematics computation, a brief, standardized test of math operations that are part of the typical curriculum at Grades 1 through 8, with national norms for Grades 1 through 12.

PGC - Professional Growth Course - Professional development activities that develop an individual’s skills, knowledge, expertise and other characteristics.

Summary

This research is designed to see if the Professional Growth Course (PGC) taken by the first grade teachers at the elementary school has an affect of an increase in overall Aims Web Benchmark M-COMP scores for the first grade in spring 2013, based on the Aims Web Benchmark M-COMP scores taken from spring 2012. The research group studied is first grade students. The first grade student’s from 2012 range from ages six to seven. There were a total of
19 females and 36 males. The first grade student’s from 2013 range from ages from six to seven. There are a total of 55 first graders, 36 males and 19 females. The PGC is designed to give teachers a background in teaching math to students with more concrete experiences. A concrete experience is considered to be one that allows students to see what is happening. An example of a concrete experience would be students using connecting cubes to make the equation $7 + 3$, and putting them together to show that the answer is 10. A professor of math, at a nearby university taught the PGC.
REVIEW OF LITERATURE

The Common Core State Standards are the national standards for English Language and Math. The standards were developed by the National Governors Association Center for Best Practices and the Council of Chief State School Officers. The people making up these groups created the Common Core State Standards (CCSS). From corestandards.org, the mission statement for the CCSS are to “provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy” (2013). The CCSS Initiative is a state-led effort that was launched in 2010. Since then forty-five states, the District of Columbia, four territories and the Department of Defense Education Activity have adopted the standards (2013).

There have been many studies conducted to see what teaching practices best reach all students when teaching math. One study, conducted by Kiger, Herro & Prunty (2012), selected third grade students in a Midwestern elementary school and had them participate in a nine-week mobile learning intervention. There were four third grade classrooms being compared. Two of the classrooms used Everyday Math and daily practice using flashcards to learn multiplication. Two other classrooms used Everyday Math and web applications for the iPod touch for daily practice. The research stated that, “on average, mobile learning intervention students answered more items correctly on the post intervention test than the comparison classroom students” (p.75).
Another study, conducted by Lalley and Miller (2006), compared the effectiveness of pre-teaching and re-teaching on math achievement and academic self-concept of third grade students who have been identified as low achievers. These results showed that when comparing the groups of students there was no difference in achievement.

In 2004, Alsawaie conducted a study, which examined the effect of language on children’s cognitive representation on numbers. There were ninety Arabic-speaking children that were asked to represent two-digit numbers using base-ten blocks. The results of the study revealed that, “language played a role in the children’s cognitive number representation” (Alsawaie, 2004, p.105).

Kostos and Shin (2010) conducted a study, Using Math Journals to Enhance Second Graders’ Communication of Mathematical Thinking in 2010. The data was collected using pre and post-tests, math journals, interviews with students and teacher reflective journals. The results of this study concluded that, “the use of a math journal has a positive influence on students’ mathematical thinking and the use of math vocabulary” (p.223).

Another article, written by Sarama and Clements, (2009), looked at and discussed three different perspectives about what type of mathematics should be taught in the primary grades. The three perspectives that were discussed were, learning substantial math is critical for primary grade children, all children have the potential to learn challenging and interesting math, and finally, understanding children’s mathematical development helps teachers be knowledgeable and effective in teaching math.

With the increases and advances in technology along with the increase in students who have been diagnosed with attention-deficit hyperactivity disorder in the recent years, Ota and DuPaul (2002) conducted a study; Task engagement and mathematics performance in children
with attention-deficit hyperactivity disorder: the effects of supplemental computer instruction. Their article studied the use of software with a game format, as a supplement to teacher instruction, to improve math performance of fourth to sixth grade students with attention-deficit hyperactivity disorder. During the study data was collected through observation, along with curriculum based probes. The study found that, “all participants showed some improvement in their performance on CBA math probes, although the extent of these improvements varied across participants” (p.254).

Another study completed by Wilson, Dehaene, Dubois and Fayol (2009), researched technology as an intervention for students. They researched the effects of an adaptive game intervention on accessing number sense in low socioeconomic status kindergarten children. This study was interesting because it seems to lie closely to the socioeconomic status of the students at the elementary school and the ages of the students that were used in the research of this paper. In this study the game intervention, The Number Race, was designed to improve number sense. The outcomes of this study showed that children improved in tasks traditionally used to assess number sense (numerical comparison of digits and words). The outcomes also showed that there was no improvement on non-symbolic measures of number sense. The authors stated that, “Focused adaptive interventions such as this may contribute to reducing the socioeconomic gap in math achievement” (p.224).

Math achievement is not only a problem at the elementary school. Throughout the Midwestern suburban school district, math achievement scores have been comparatively lower than other school districts across Missouri, the United States, and when being compared internationally. According to, globalreportcard.org (2012), the school districts math scores are at a 54% (The percentage score represents the percentage of U.S. students who would have a lower
level of achievement.) when being compared other districts across the state. The school districts math scores are at a 57% when being compared to districts across the United States. The school districts math scores are at 48% when being compared to scores internationally.

The professional development course that the teachers at the elementary school participated in was to directly affect mathematics instruction. Little (1987) defined professional development as “any activity that is intended partly or primarily to prepare paid staff members for improved performance in present or future roles in the school districts” (p.491).

Professional development’s affect on student achievement has been researched. According to, Desimone, Smith, and Phillips (2013); “when teachers participated in professional development that focused on math content or instructional strategies in mathematics, they were more likely to teach in ways associated with student achievement growth” (p. 106).

Telese’s (2012) research on professional development and the affects on achievement are comforting, to a teacher who regularly participates in professional development. He suggests that, “Literature suggests that teachers who receive professional development in content knowledge and pedagogical knowledge are more effective” (p.106). Not only do teachers need to know what they are teaching they need to know how to implement the content in the classroom. Professional development can be conducted in a variety of ways, such as study groups, curriculum development, or mentoring, but it is commonly in a form of workshops, seminars, or college. The professional development conducted in the case of this research, the style was mostly of workshops. Professional development in how students learn tends to adversely affect student achievement. Professional development topics that include training in content standards, the available curriculum materials, instructional methods for teaching mathematics and effective use of calculators in mathematics instruction where found to be positively related to student
achievement when compare with no professional development as long as teachers received small extent of professional development in these areas.
RESEARCH METHODS

Research Design

The research conducted was based off of the Aims Web math computation (M-COMP) is a revised collection of math computation probes that is consistent with the Aims Web Math Concepts and Applications (M-CAP) in terms of format, number of benchmark and progress monitoring probes per grade, scoring rules, and reporting. Features of the M-comp include; enhanced content to increase overall rigor and align more closely with NCTM standards, a student friendly format, three benchmark probes and 30 progress monitoring probes, with fewer, but more targeted items, and updated and streamlined scoring rules. The M-COMP is administered to students in the fall, winter, and spring. The students who took the CBM in spring 2012 are going to be compared to the students who took the CBM in spring 2013. On the first grade M-COMP, students are assessed by size of numbers, column addition, basic facts, and complex computation. The independent variables are the classes of students whose teachers either took the course or did not take the course. They are changing what they know about teaching math through the Professional Development Course. The dependent variables are the M-COMP scores.

Study Group Description

Participants include 54 first grade students from 2012, compared to 55 first graders from 2013, who attended the elementary school. The first grade student’s from 2012 range from ages six to seven. There were a total of 25 females and 29 males. Of the 54 first graders from 2012, 50% qualify for free or reduced lunch. Of the 54 first graders from 2012, 75% are white, 8% are Hispanic, 14% are African American, and 3% are Asian. The first grade student’s from 2013 range from ages from six to seven. There are a total of 55 first graders from 2013, 36 males and
19 females. Of the 55 first graders from 2013, 48% qualify for free or reduced lunch. Of the 55 first graders, 79% are white, 10% are Hispanic, 8% are African American, and 3% are Asian.

Data Collection and Instrumentation

The data will be collected from the archives of 2012 spring M-COMP scores and the 2013 spring M-COMP scores. These archives are housed at the elementary school.

Statistical Analysis Methods

A t-test was conducted to find if there is a significant difference in student’s scores taken from the same test, in different years, and compare the differences, based on the change made by the PGC taken by the first grade teachers in 2013. The scores were taken into two groups the first group is results from students whose teachers were not involved in the PGC, and the second group is results from students whose teachers were involved in the PGC. The alpha level was set at 0.25 to test the null hypothesis: The null hypothesis states that there is no difference in student achievement as measured by the Aims Web Benchmark M-COMP scores between students taught by teachers who have not taken the Mathematics Professional Growth Course compared to teachers who have taken the Mathematics Professional Growth Course.
FINDINGS

A t-test was conducted to decipher where there was a difference in performance by students in spring 2012 M-COMP scores, based on the teachers who were involved in the PGC course and performance by students in spring 2013 M-COMP scores, based on teachers who were involved in the PGC course. There are only two years of data to be considered. In 2011-2012 the PGC course had not been conducted, and in 2012-2013 the PGC course had been completed.

Figure 1

t-Test Analysis Results for 2011-2012 Student M-COMP scores

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean</th>
<th>Mean D</th>
<th>t-test</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012 (n=54)</td>
<td>2.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2013 (n=55)</td>
<td>3.2</td>
<td>-0.3</td>
<td>-1.68</td>
<td>100</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Note: Significant when p<=0.25

Two years of spring M-COMP scores were selected for a study, spring 2012 and spring 2013. These scores were selected determine if there is a difference between the scores. The spring 2012 scores were based on students whose teachers had not participated in a Math PGC course, the spring 2013 scores were based on students whose teachers had participated in a Math PGC course. The scores of the M-COMP were delivered in the following formats: well below average, below average, average, above average, and well above average. These formats were quantified based on the following: well below average = 1, below average = 2, average = 3, above average = 4, and well above average = 5. The mean of the spring 2012 scores was 2.9 and the mean of the spring 2013 course was 3.2. The mean d, or difference between the two groups
was -0.3. The t-test result was -1.68 and the df was 100. The null hypothesis states that there is no difference in student achievement as measured by the Aims Web Benchmark M-COMP scores between students taught by teachers who have not taken the Mathematics Professional Growth Course compared to teachers who have taken the Mathematics Professional Growth Course. This null hypothesis was not rejected because the p-value, .96, which is lower than the alpha level, 0.25. This shows that the students scores that were taken between both years have no significant difference and that the scores that were taken from the 2013 group of students who were taught by teachers who took the Mathematics PGC course were not affected.

Figure 2

The mean of the spring 2013 students M-COMP scores was 3.2. This means that a little less than 80% of the spring 2013 students M-COMP scores were in the top two tiers of the scores were in the top 2.5% of the percentiles calculated at the school level on the M-COMP. The pie chart shows that the number of spring 2013 students M-COMP scores was lower at a mean of 2.9.

Figure 3
There are five categories in which students can score on the M-COMP. These categories are based on the number of questions that the students answered correctly. The categories are: well below average, below average, average, above average, well above average. The chart shows that in well below average the students from both years score the same in the well below average, more spring 2013 students scored in the below average range, more spring 2012 students scored in the average range, more spring 2013 students scored in the above average range and in well above average the students from both years scored the same in the well above average.

<table>
<thead>
<tr>
<th>Score Descriptions</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Below Average</td>
<td>Spring 2012 (3)</td>
</tr>
<tr>
<td>Below Average</td>
<td>Spring 2012 (6)</td>
</tr>
<tr>
<td>Average</td>
<td>Spring 2012 (25)</td>
</tr>
<tr>
<td>Above Average</td>
<td>Spring 2012 (5)</td>
</tr>
<tr>
<td>Well Above Average</td>
<td>Spring 2012 (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score Descriptions</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Below Average</td>
<td>Spring 2013 (2)</td>
</tr>
<tr>
<td>Below Average</td>
<td>Spring 2013 (7)</td>
</tr>
<tr>
<td>Average</td>
<td>Spring 2013 (26)</td>
</tr>
<tr>
<td>Above Average</td>
<td>Spring 2013 (4)</td>
</tr>
<tr>
<td>Well Above Average</td>
<td>Spring 2013 (1)</td>
</tr>
</tbody>
</table>
CONCLUSIONS AND RECOMMENDATIONS

The hypothesis stated that there is no difference in student achievement as measured by the Aims Web Benchmark M-COMP scores between students taught by teachers who have not taken the Mathematics Professional Growth Course compared to students teachers who have taken the Mathematics Professional Growth Course. The outcomes reported from this study show that there is not a significant difference in student achievement as measured by the M-COMP Aims Web Benchmark scores between students taught by teachers who have not taken the Math PGC compared to the teachers who have taken the Math PGC. The t-test from the 2011-2012 scores indicated that the p value was 0.96, which was higher than the alpha level set at 0.25; therefore, the null hypothesis is test and is not rejected. There is not a difference in student achievement as measured by the M-COMP Aims Web Benchmark scores between students taught by teachers who have not taken the Math PGC compared to the teachers who have taken the Math PGC.

The conceptual underpinning of the elementary school staff is not supported by these findings. The staff that participated in the PGC course expected a higher achievement of M-COMP scores for the first grade students. The higher achievement was not found, based on the M-COMP scores from spring 2012 when compared to the M-COMP scores from spring 2013. Although the mean was actually higher after the PGC was conducted, it was not statistically significantly higher.

After concluding this study there are some further studies that could be conducted. New test scores from the years 2013-2014 could be considered in comparison to the scores from 2011-2012. A study could be performed to see if after students’ who are taught by teachers who
completed the PGC after two years show a difference in achievement, and for the years after to see if the effect of the PGC course is long-term achievement.

Questions have formulated about the new standards that have been set into place as well. In the 2012-2013 academic school year the Common Core State Standards were implemented by all of the teachers who took place in the research. The standards were different for the 2011-2012 academic school year. Do the Common Core State Standards being in place make a difference in student achievement? More data could be collected from the elementary school Aims Web archives to perform another study to see if the standards impact student M-COMP achievement.

Teaching is about a life-long learning process, always working towards what you find out works for student achievement and changing the practices of teaching in order to hinder student successes. Professional Growth Courses, college courses and trainings are all a part of the learning community among teachers.
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