

How manipulatives affects math achievement education essay



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Manipulatives help students get started, but manipulatives alone are not enough for complete understanding. Teachers have to lay a clear path and connect the dots between concrete, representational, and abstract understanding.

The purpose of my research is to examine the effects of computer-based manipulatives on problem solving and the students' attitudes toward computer-based learning of mathematics concepts. The focal point will be to introduce new 4 geometry concepts to middle school students in my 6th grade class. I plan to experiment by initially introducing the geometry concepts using the computer-based manipulatives for concrete understanding. Next the lesson plan will have students represent their concrete understandings (representational) by drawing pictures. Finally, the lesson plan will end with word problems and challenging questions to support the process of transferring abstract understanding.

I. 1 Introduction: The Problem (clearly articulate problem, Why action research?)

“ To understand is to invent” — Jean Piaget

I chose math to do an action research study because I enjoy teaching mathematics. In my career as a teacher, mathematics is the subject that I find that students seem to have the most apprehension and lack the most prerequisite skills.

At the start of the school year, I find that most of my students have not mastered even basic mathematics fact and concepts. For example, when I give the basic 5 minute multiplication drill at the beginning of the year most

of my students take upwards of 12-16 minutes to complete. 5th grade topics like multiplication using decimals, place value, comparing basic fractions, etc. all require “ remedial” lessons.

My immediate response it to try to work in daily multiplication drills...[saxon]

So as they move into a middle school curriculum, they have difficulty understanding and retaining more abstract Algebra and Geometry concepts.

The obstacles are reflected in test scores. The biggest challenge I see is with Brief Constructed Responses (BCR's).

Examples [mdk. org]

Student responses lack procedural and conceptual understanding. In reading many of my students BCR's they lack problem solving skills to answer the short answer portion correctly. In the written explanation part of the BCR they lack conceptual understanding and have trouble explaining the “ How” and “ Why”. In some cases this could simple be due to poor written communication skills.

While planning for my third grade math class, I often wonder to myself how effective is the use of computer-base math on students' problem solving. What are students' attitudes toward computer-based mathematics and, what effect their attitudes have on implementation of computer-based math?

A popular approach in elementary, to help students understand abstract concepts, is the use of manipulatives. Easy to see and touch, manipulatives make it easier for students and teachers to represent abstract concepts and

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relate these concepts to prior knowledge. I am curious to know if using manipulatives can play a part in addressing my problem. Teachers have to lay a clear path and connect the dots between concrete, representational, and abstract understanding.

I used these techniques independently of each other, put never together as a cohesive unit... As a teacher I felt like I got more understanding, but I never objectively measured it.

I. 2 Introduction: Prove the Problem (clearly illustrate, give examples, describe the nature of...)

My research will answer these questions by looking at the effect computer based mathematics curriculum have on problem solving. Problem solving is one of the hardest concepts for students to grasp especially in word problems. Students generally have a difficult time determining what information they need or which operation they should perform. Difficulty comes from the inability to understand the wording of the problems. In my school here at Sadie Tillis I believe the problem stems from the lack of background knowledge and the meager help these students receive from home. Sadie Tillis is a Title 1 School which means the majority of our students are on free or reduce lunch. We are also a Reading First School. Sadie Tillis is located on the southwest side of Jacksonville, Florida. Our students come from two low income apartment complexes, trailer parks, and at least three stable sub divisions. Fifth grade students at Sadie Tillis have a history of low FCAT math scores. Students in grade 3 and 4 have shown progress, but fifth graders are still struggling to meet the standards in math.

This problem is the reason I decided to look at the effect computer-based math program have on problem solving. I think fifth grade math students need an extensive background in math, which most of our students do not have. The deficiencies do not surface until later grades. If I can find a way to bridge the gap in the earlier grades it will prevent the deficiencies in upper grades. I am a 3rd grade teacher at Sadie T. Tillis Elementary. I am also a member of the Jacksonville Urban Systemic Initiative in Jacksonville, Florida. I received my master's degree from The University of North Florida.

I. 3 Introduction: Relevant Information (details, available recourses, etc)

For the last two years, my sixth grade class, has been an all male class. This year my class of 28 students included 2 Pilipino, 4 Spanish, and 22 African American males. Even prior to having an all male class, I made a commitment to nurture and encourage my male students to work hard and excel particularly in mathematics. By the end of this year, I had 10 boys in a class of 28, that consistently demonstrated the ability to excel in math.

These students consistently scored advanced on the 16 state unit tests I gave this year and on the end of year math benchmark exam. But most of my class was content to do mediocre work, doing just enough to get by.

I teach in Fort Washington, Maryland, a neighborhood situated behind the elegant new National Harbor convention center and resort, a 300 acre, 2 billion dollar waterfront resort. Located in a suburb of the South East part of Washington, D. C., this school is surrounded by a community of working- and middle-class families. Fort Washington is a prosperous community, with a household median income over \$100, 000. Fort Washington has a 70%
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majority African American population, 20% White, and 10% Hispanic, Asian, Indian, etc. There are about 25, 000 people and 8, 500 households and 40% of them are separated or divorced families. Parent participation at my school has been very low, I may have about 5 parents each year who consistently inquire and follow up on their child's academic performance.

I am a graduate of this school and grew up in this neighborhood. After leaving a career as a computer programmer and IT trainer. I have since then, been a 6th grade teachers for five years, teaching all subjects at Fort Foote Elementary. I have a passion for teaching and finding answers to my questions about improving education for African American and minority male students in particular. That passion comes from many years of watching young men struggle and not reach their true potential. They struggle to make a living and for many the financial strain leads to the break-up of the family.

Now as a teacher I am part of the system and I would like to see that system change. I was quick to realize that I need to make some changes in my strategies in order to be a more effective teacher. I must say that I was not pleased with my own performance this year. Generally 2/3 of my class scored “ proficient” or below 70% on math unit assessments. Only 30% of my students consistently scored of 70% or “ advanced” on math unit assessments. My motivation is that, I can do better and my students can do better. But I wonder how can I help my students?

I began my research with the following question: What strategies will best help my students better understand and be successful in mathematics? I

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started to try and identify the factors that may cause the young men in my class to underperform in math. In student journals This year to gain insight For writing warm-up I had the students respond to 2 questions what do you like about school? And How could Math class be better? I found that boredom was a major recurring theme.

From my own observations, I notice real quick that a lot of my male students have a hard time mentally focusing and just physically sitting still for extended periods of times. Tapping on the desks and chairs, nervously tapping with rulers, pencils or pens, doodling on paper, the desk, chairs is a regular occurrence in my class. The new thing is drawing tattoos all over their arms with pens in class. One classroom management technique I used to manage these behaviors this year was to let them go to the bathroom and get water during the day. one at a time except during lecture time. Many teachers do not let the students leave the room at all during the day except during lunch and recess.

Observing how much the students like to draw, I started to look for ways to integrate drawing into the math lessons. Mammoth teaching guides... Work samples... From a teaching

My instinct tell me I strongly believe Manipulatives have been found as a tool that helps facilitate students understanding of mathematics concepts (Reimer & Moyer, 2005; Steen, Brooks, & Lyon, 2006; Suh & Moyer, 2007; Suh, Moyer, & Heo, 2005). The positive results appear to be due to the visual and kinesthetic nature of these manipulatives and students' ability to use them interactively (Reimer & Moyer, 2005; Suh et al., 2005).

Resources

Virtual Manipulative Web sites

Web Addresses

Library of Virtual

Manipulatives

<http://nlvm.usu.edu/>

eNLVM

<http://enlvm.usu.edu/>

Illuminations

<http://illuminations.nctm.org/>

Interactivate

<http://www.shodor.org/interactivate/activities/>

MathTools

<http://www.mathforum.org/mathtools/>

Arcytech

<http://arcytech.org/java/>

Illuminations

Algebra concepts

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<http://illuminations.nctm.org/ActivityDetail.aspx?ID=26>

II. 1&2 Literature Review: Identify resources & Inform what others have written

“ Many people regard mathematics as the crown jewel of sciences. Yet math has historically lacked one of the defining trappings of science: laboratory equipment. Physicists have their particle accelerators’ their electron microscopes: and astronomers, their telescope. Mathematics, by contrast, concerns not the physical landscape but an idealized, abstract world. For exploring that world, mathematicians have traditionally had only their intuition” (Klarreich, 2004, p 266). Now, computers are starting to give mathematics the lab instruments they have been missing. A study by Klarreich (2004) discusses the role computers play in mathematics. The authors stated that computers’ power is enabling mathematicians to make quantum leaps into mathematics. Computers take only seconds to calculate and create beautiful graphics of three-dimensional shapes. Computers can solve complex problems and computers can remediate students in mathematics. A study by Leigh (2004) discusses the idea that games promote cognitive and problem-solving skills. The paper states that most children are “ masters of the game. Young children can sit at a computer for hours on hours playing computer games. Therefore, since children like playing game, teachers should create computer math game so that students may practice computation on the computer. The computer games should include learning strategies to increase students’ comprehension. These games should reinforce learning, provide immediate feedback, and improve test-taking skills. The computer math practice can also be used to replace

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drill work. Computer games can be constructed to meet the curriculum objective. Another study by Lederman & Niess (1999) discusses the role computers play in helping students study math and science in the real world. The authors' primary point is that computer technology, along with other technology enhancements, affords students and efficient means through which higher level thinking skills can be enhanced. The authors state that math should be "authentic." A study by Cyr (2004) examines a gifted boy who used an accelerated math computer curriculum to challenge his intellect. A teacher of the gifted decided to do a case study on the effectiveness of accelerated computer math, in order to enrich a gifted student she had in her class. This student scored a 150 on the Otis Lennon Exams and had a 99th percentile rank complete battery score for the fifth grade Stanford Achievement Test, as well as the higher rank possible on the TOMA (Test of Mathematics Ability). The computer math

II. 3 Literature Review: Summarize main findings from articles

III. 1 Action Research Plan: Detail the specific actions you used to improve your problem

Based on the research and my experience manipulatives can improve understanding, I think drawing gives students a method of problem solving that is more natural (visual and kinesthetic). The computer program that will be used in this study is Edutest. Edutest is a computer program that focuses on problem solving strategies, geometry, number sense, logic patterns, measurement, probability, and word problems that are in line with the district standards. The students will work independently on the computer

with computer-guided instruction. During the study, students will take a pre-test and posttest as well as on-going daily instruction in mathematics along with teacher made assessment tests in mathematics to measure their achievement levels. I will also take an attitude survey to gauge their feeling about using computer mathematics. A survey was given pre study and post study. This information was used to assist me in planning and implementing computer-based curriculum and to see whether their attitudes towards computer math will have an effect on how well they implement the program.

III. 2 Action Research Plan: Describe changes throughout the study

[describe everything you tried to do to improve your problem]

Incorporate more writing

III. 2 Action Research Plan: Describe data you are collecting and the rationale for each

IV. 1 Results: Clearly write a list of assertions: how your problem was improved

IV. 2 Results: Assertions: how your problem was not improved, new concerns

IV. 3 Results: Proof your assertions using your data: convince. Data reliable?

V. 1 Conclusion: Summarize your study

[Insert Abstract here]

V. 2 Conclusion: Suggestions: What can others gain?

V. 3 Final Reflection: Overall learning process?