Running Head: Math Difficulties

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Many students question why they have to learn math skills. They tend to not see the relevance to their life at that time and do not think they will ever use it. On the contrary, math is used in almost everything they do, whether they realize it or not. We as educators and parents need to show our children and students just how important math is.

Whether you are buying a car, sailing a boat, building a house, baking cookies, or buying Christmas presents you need math. Math is a universal language. It is not written with words but rather with numbers that cross through any border. Math helps people to make wise decisions and execute everyday tasks. Not only is it important in everyday life and in the "real world" but it also is entwined in almost every subject taught in schools today.

Math is one of the most important and critical subjects taught nowadays. Though, it tends to be one of the most difficult subjects to master. Many students have trouble with math which only worsens when they reach adulthood. If students do not learn critical basic math, computation, and problem solving skills they struggle in all aspects of their life. Some students have math disabilities such as learning disabled in math or dyscalculia. These disabilities can severely affect their life skills that are necessary for successfully functioning as a part of society and their lives an adult. The purpose of this paper is to explore basic math skills, problem solving, and computation skills associated with math difficulties.

Basic Math Skills

Within the first year of a child's life they naturally learn numbers and geometry. Therefore most children start school with some knowledge of mathematics whether they know it or not. This is due to young children being interested in situations and activities that are filled with math. "Kindergartners' play often involves at least implicitly mathematical ideas, such as

classification (a girl puts blocks away in categories), magnitude ('This isn't big enough to cover the table'), enumeration (a boy says, 'Look! I got one hundred!' and he and a friend count to check his estimate), dynamics (a girl makes a flat, circular shape out of dough), pattern and shape (a boy builds a symmetrical structure with blocks), and spatial relations (a girl offers a location or direction)" (Sarama, 2006, p.38). This does not mean that parents or educators recognize students' potential for learning at such a young age. Before children enter kindergarten, most know less about math than children from other countries (Sarama, 2006, p.39).

In response, the United States Department of Education has developed research based standards that are implemented in grades kindergarten-twelfth and no child is exempt from these standards regardless of a disability or not. "These standards identify the key concepts and skills children need to gain comprehensive and ability in mathematics, and there are many different means of implementing these standards" (Sarama, 2006, p.40).

The state of Virginia has developed their own set of standards of learning to be executed in grades k-12. The state provides the framework for instructional programs educators can follow in order to raise students' academic achievement (Virginia Department of Education, 2001). In order to meet these standards students must learn to use an assortment of techniques and tools to work out the math problem, including paper and pencil, mental arithmetic, estimation, and calculators (VDOE, 2001).

> The content of mathematics standards is intended to support the following five foals for students: becoming mathematical problem solvers, communicating mathematically, reasoning mathematically, making mathematical connections, and using mathematical

representations to model and interpret practical situations (VDOE, 2001).

These standards can lead to both students and educators frustrations. Students are tested by the state in order to monitor their progress and achievement in these five areas. Students with mathematical disabilities tend to do poorly on these multiple choice tests. In response the state has created alternative testing for students who cannot take the standardized SOL test. The VGLA and VAAP are the alternative tests students can take in order to prove they have learned particular standards. This lessens both the frustration and the takes away from the scariness of math. By allowing students to show their class work as evidence enables the teacher to provide different methods of teaching mathematical concepts. It allows for real world models to be used as well as textbook problems.

Still when some people hear the word math the first thing that comes to their mind is the word scary. They might see it as being too much work, too many numbers, too structured, or another chance for failure. This is why teaching math to students with disabilities is a difficult challenge. Math teachers do not always show the relevance or practical application for math they are teaching. Traditionally math is taught with rigid modus operandi that is hard for the students to grasp. This does not always have to be the case. There is no one way to solve a math problem. Everyone has a different style of how they learn. People who are learning disabled can have difficulty with math because they approach solving a problem in different nontraditional ways.

In order to find out how people with math disabilities learn a study was conducted using both children and adults to determine if math disabilities are due to a domain-general or a domain-specific working memory deficit (Wilson, 2001, p.237). The study found that "regardless of age, deficits in mathematics are mediated by both a domain-general and a domain-

specific working memory system" (Wilson, 2001, p.247). This means that it does not matter how old a person is who has a math disability. The critical role player in mathematic ability is their individual working memory system. This leads to different learning styles.

In order teachers to be effective they must plan lessons which engage all the learners and provides them with worthwhile tasks. By incorporating visual, auditory, and tactile experiences the teacher will touch base on all of the different learning styles of the class while intellectually challenging the students. "Mathematical ideas and concepts should be introduced using intriguing tasks based on real world experiences that could simulate the intellectual curiosity of the students" (Shultz, 2003, p.310). If the teacher provides well thought out tasks for students to complete, their inquisitiveness and interest will draw them into the lesson. The tasks at hand can both be real world experiences or by the book math. "By providing students with problems that challenge their intuition, teachers also are giving them a spark to ignite a greater interest in mathematics and its many connections to the world" (Shultz, 2003, p.310).

As you can see it is extremely important to show students how math is applicable to their life and how it is used in every day society. Basic math does not need to be boring or scary but a great learning experience that ties the textbook to everyday life.

Dyscalculia

Dyscalculia is a learning problem that affects many people. It is distinguished from other disabilities by the person having a poor understanding of number concepts and the whole number system in general (Vaidya, 2004, p.717). "Difficulties are presented in counting, giving and receiving change; tipping, learning abstract concepts of time and direction, telling and keeping track of time and the sequence of past and future events" (Vaidya, 2004, p.717). Students who

have dyscalculia are not capable of functioning with these mathematical landmarks common to their age group (Vaidya, 2004, p.717).

Students with dyscalculia also find learning and recalling number facts difficult (Vaidya, pg. 718, 2004). They have trouble using procedures and rules to build on already learned facts (Vaidya, 2004, p.718). These difficulties pose huge problems in learning basic math skills. For example, students may have learned that 4+2=6 but not grasp the concept that 2+4=6. Mahesh Sharma (2001) came up with seven prerequisite math skills students should have by age 11 years (see Appendix A). "Without these skills, any math learning that takes place is essentially temporary" (Vaidya, 2004, p.720). In order to students with dyscalculia overcome their disability teachers must know what the best researched teaching methods are and utilize them. A summary of best practices has been devised for teaching students with dyscalculia (see Appendix B).

Problem Solving Skills

According to the Virginia Standards of Learning students need to be able to apply math concepts, skills, and the relationships among them to solve problem situations of assorted difficulties (VDOE, 2001). They also must identify and create problems from real life data and situations within and outside math and then apply appropriate strategies to find a suitable answer (VDOE, 2001). In order to do this students' must develop a collection of skills and strategies for solving a wide range of problems (VDOE, 2001).

Students who have dyscalculia often do not understand what type of arithmetical operation and strategy is being asked for in word problems (Vaidya, 2004, p. 718). This poses huge problems when it comes to the standards of learning being met. "Students ability to

understand the language found in word problems greatly influences their proficiency at solving them" (Vaidya, 2004, pg. 719). In order to overcome this dilemma students must be taught mathematical language. "The syntax, terminology, and the translation from English to math language, and from math language to English must be directly taught" (Vaidya, 2004, p. 719). It is no wonder that mathematical vocabulary poses a problem to some children with math disabilities. Many times there is more than one word that means the same thing. For example, "subtract," "take away," and "minus" all mean the same thing and are used intermittently with each other. This means that the student needs to know what all three mean instead of just one word. Then there are other words that are not used in everyday conversation and must be learned specifically for math class. "Sometimes a student understands the underlying concept clearly but does not recall a specific term correctly" (Vaidya, 2004, p. 719). Teachers need to continue to teach and review math vocabulary as an every day activity in order for students to speak and understand the language of math.

Service Learning

> In September 2005, the Organization for Economic Cooperation and Development released a study showing that the United States is losing ground in education as other nations show larger gains in academic achievement and school graduations; by the fifth and sixth grade, our children are off the technical track, and 15 year-olds in the U.S. are below average compared with their peers in Europe and Asia in terms of applying math skills to real life situations (Shank, 2005, p. 126).

It is evident that our students need real life math situations implemented into their every day school instruction. Having students use real life situations is not only a necessity in closing

the gap between countries but it makes the student more apt to learn. By applying skills that you learn, you are able to retain what you have learned longer. The school can provide service learning opportunities for students in all grade levels to try out and use their math skills in real life settings. In 1990 the Mathematical Sciences Education Board of the National Research Council stated that, "Students who progress though this curriculum develop a kind of mathematical myopia in which the goal is to solve artificial word problems rather than realistic world problems" (Duke, 1999, p.794). They also stated that the main goal of instruction should necessitate students "to use mathematical tools in contexts that mirror their use in actual situations" (Duke, 1999, p.794). Service learning does exactly this. It can be implemented both as a means of bettering the community the student lives in as well as a way of taking school mathematics into the real world (Duke, 1999, p.794). Service learning was defined by Kahne and Westheirmer (1996, p.593) as making "students active participants in service projects that aim to respond to the needs of the community while furthering the academic goals of students."

Examples of service learning projects that would use mathematics in different ways are: making park benches, environmental monitoring, tutoring younger students in math, recycling, landscaping, automotive work, operating small businesses, shopping for senior citizens, conducting surveys, calculating growth rates in gardens, and reviewing statistics on violence (Duke, 1999, p.794). It is evident that community service has the potential to take school math into the real world. If schools could implement these programs as math courses or if math teachers could use community service projects as a graded assignment the possibility of students grasping mathematical concepts is astronomical. All it takes is a little creativity, planning, and will power to take math to the next level.

Computation Skills

Students with learning disabilities in math often have difficulty with computation skills. "Active student responding is often required to remedy computation skill deficits in students with learning disabilities" (Wildmon, 2004, p. 106). This may be difficult to these students because they might find computation assignments fruitless and exasperating, and be less likely to choose to do computation tasks (Wildmon, 2004, p. 106).

A study was conducted by researchers to "investigate the effects of adding and interspersing additional short computation problems on academic performance, assignment perceptions, and homework choices of students with learning disabilities in math" (Wildmon, 2004, p. 118). The study concluded that "target problem (i.e., 4-4) completion rates and accuracy levels did not differ across control and interspersal assignments, but students completed significantly more total problems on the interspersal assignment" (Wildmon, 2004, p. 119). This shows that students are increasingly likely to complete more problems on an interspersal assignment. The study also explained that students preferred interspersal assignments for their choice of homework because it took less time to complete even though there were more problems to be completed (Wildmon, 2004, p. 120). These findings show that teachers should not lessen assignments but in fact they should increase assignments by adding and interspersing short problems in order to increase students' response rates as well as uphold the skills associate with the shortened problems (Wildmon, 2004, p. 120). "The additive interspersal procedure may prove to be an efficient procedure that enhances students' perceptions of assignments and the probability of their choosing to engage in computation assignments without watering down the curriculum" (Wildmon, 2004, p. 121).

Discussion

There is much to be done still in the field of math learning disabilities. Unlike reading disabilities, little has been researched about math learning disabilities. "Math disability researchers are still working to define math learning disabilities and to identify underlying cognitive or genetic attributes" (Vaidya, 2004, p.718). To try an alleviate the problem of students not learning crucial math skills in school, both the federal and state departments of education have implemented rigorous standards for all students to achieve. These standards try to bring together technology, real world and classroom experiences in order for the student to succeed in math.

Often frustrated students will question why they have to learn to do math using their brain and pencil and paper since there is so much new technology out there to do it for them. Students need to know that technology is not always available when they need it. Therefore, if they learn how to do math on their own or in their head they always have the tools needed to solve the problem. They also need to learn how to do basic math in order to correctly use technology. A calculator is a great tool to have, but if you do not know how to set up a basic math problem the calculator is useless. Technology can also be a hinder in certain situations. For example, if the student is playing a game where they have to add up the score often, a calculator would be very time consuming and possibly embarrassing.

Students should also learn that the technology that helps them to do math today was created by a person would knew how to do utilize math skills in order to invent the new technology. For example, solving math problems was the first computer application. If the inventor of the computer never learned basic math we would not have the luxury of the computer

today. Almost everything around us relies on math in some shape or form. People need basic math skills to teach their brain how to analyze and think critically in all aspects of life.

Teachers need to use a healthy balance of technology, real life situations, and textbooks in order to teach greatly needed math skills. “The National Council of Teachers of Mathematics standards call for relating mathematics to everyday activities and making school mathematics reflect the practice of mathematicians” (Anonymous, 2003, p. 96), but they are not the only ones. State standards such as that of Virginia also call for a combination of the two. Students must be taught basic math, problem solving, and computation skills in order to survive in society no matter how challenging it may be for them to learn it. They may not ever like math but with good instruction they can be taught to use it and appreciate it.

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Appendix A

Seven Prerequisite Math Skills

1. The ability to follow sequential directions;
2. A keen sense of directionality, of one's position in space, and of spatial orientation and organization;
3. Pattern recognition and extension;
4. Visualization-key for qualitative students- is the ability to conjure up and manipulate mental images;
5. Estimation-the ability to form a reasonable educated guess about size, amount, number, and magnitude;
6. Deductive reasoning-the ability to reason from the general principle to a particular instance;
7. Inductive reasoning- natural understanding that is not the result of conscious attention or reason.

Source: Vaidya, S.R. (2004). Understanding dyscalculia for teaching. *Education*, Iss. 4, 717-720.

Appendix B

Summary of Best Practices

8. Teaching the language of mathematics
9. Teaching focusing strategies
10. Using visualization to help with sequencing
11. Providing practice with the understanding of the number concept and underlying concepts such as seriation and classification.
12. Guided practice in reading word problems
13. Prenumber skills and numeration
14. Action teaching
15. Immersion therapy

Source: Vaidya, S.R. (2004). Understanding dyscalculia for teaching. *Education*, Iss. 4, 717-720.