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**GENERAL FACTORS CAUSING MATHEMATICAL ANXIETY AMONG UNDER GRADUATE STUDENTS**

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**ABSTRACT**

*Math anxiety is a feeling of tension, worry, and/or fear in situations involving math-related activities. The relationship between Math anxiety and math cognition has been frequently studied, and the negative associations between the two have been observed at multiple levels of mathematical processing ranging from simple counting to complex math problems. These negative associations are evident across various developmental stages. The aim of this study is to identify teaching and learning methods in higher education that students high in math anxiety use and benefit from. Through an anonymous online survey, psychology students enrolled in a statistics course rated their Math anxiety, Subjective numeracy, and Objective numeracy; in addition, they rated their success in the statistics course and their general preference for different forms of learning (e.g., face to face learning, online course material, as well as the use of the online video material presented on University of Gothenburg's learning management system [GUL]). The results gave no support to the notion that students high in Math anxiety used online teaching tools more than other students. However, students high in Math anxiety said they used their classmates as help to pass the course to a greater extent compared to those lower in Math anxiety.*

**Key words:** Anxiety, Cognition, Memory

**INTRODUCTION**

Maths anxiety can be defined as a feeling of tension, apprehension and anxiety that interferes with maths performance ability the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations [1]. According to Olango [2] maths anxiety consists of an affective, behavioural and cognitive response to a perceived threat to self-esteem that occurs as a response to situations involving mathematics. Maths anxiety, which is rooted in emotional factors, can be differentiated from dyscalculia, which is characterized by a specific cognitive deficit in mathematics [3], in two ways. Firstly, maths anxiety can exist in people who have maths capability even though they may dislike maths. Secondly, maths anxiety has an emotional component which is not the case in dyscalculia [4].

Maths anxiety may occur in all levels of education from primary school to university education. Harari et al. [5] reported that negative reactions and numerical confidence are the most salient dimensions of maths anxiety in a sample of first-grade students. Similar findings were also observed at tertiary levels across multiple disciplines, including health care professions. For example, Roykenes and Larsen [6] studied 116 baccalaureate nursing students and found that there was a negative relationship between previous mathematic likes/dislikes and self-assessment of mathematic ability.

Since the 1960s researchers have tried to compare different teaching styles and evaluate the inclusion of technology to facilitate a better learning environment (Schurdak, 1967). Tamim et al. (2011) identified “well-conducted” comparative studies covering 40 years of research. They concluded that there was a slight positive influence of being taught in a blended learning environment. However, the measured difference was quite weak, and the authors conclude that among everything that influences teaching and learning (*aspects of the goals of instruction, pedagogy, teacher effectiveness, subject matter, age level, fidelity of technology implementation, etc.*) technology intervention accounts for only a small part of the effect. However, general comparisons between “older” and “newer” types of teaching and learning tend to favor the latter. It is important to note, where differences have been found, they are often attributed to factors other than the mode of delivery (Bates, 2015). Hence, there is reason to believe that blended learning is especially beneficial for certain individuals. This study will investigate the relationship between a student's math anxiety and use as well as preference for different forms of teaching in a statistics course using blended learning. The teaching methods used were (1) classical face-to-face lectures, (2) a text book, (3) assignments from the text book, (4) online assignments developed by the teacher on the university's learning platform (GUL), (5) online lectures developed by the teacher on the university's learning platform, and (6) online lectures on YouTube; lastly, (7) help from a friend. Methods 1 through 3 are considered classical forms of teaching, while 4 through 6 are considered new forms of

teaching; taking help from a friend (7) is considered outside the categorization of new and old teaching, however, represents something students often do and were encouraged to do.

### **CAUSES FOR MATHEMATICAL ANXIETY**

Math anxiety is caused by poor test grades, inability (or unwillingness) to complete difficult assignments, negative predispositions of parents, and even the mathematics teacher. Teachers and parents that are afraid of mathematics pass that on to their students and children (Furner & Duffy, 2002). It could be very difficult for students .. Math Anxiety 8 to like mathematics when their parents did not do well in mathematics themselves, and thus do not understand it or do not think it is important. Students could see their parents as having a job and doing well without a great love for mathematics and think that they will be successful without an appreciation of mathematics as well. If the teacher does not value mathematics, his students certainly cannot be expected to value mathematics either. There are many things the mathematics teacher can do that will provoke his students to dislike mathematics. The teacher may be perceived as not caring about students because he is unwilling to give extra help to students who need it. The students need to know that their teacher is able and willing to help them. The teacher may become angry or frustrated when his class does not understand the problems. The teacher may also have unrealistic expectations of his students. Covering the textbook problem by problem can turn students off from learning mathematics. Also, giving written work every day, insisting there is only one correct way to complete a problem, and assigning mathematics problems as punishment for misbehavior can cause students to dislike mathematics (Furner & Duffy, 2002). No one enjoys discipline. Making students do mathematics as a form of discipline could very likely cause students to dislike mathematics. Another major source of math anxiety is the teaching approach of "explainpractice-memorize" (Steele & Alfred, 1998, p. 18). The mathematics teacher needs to be creative in his teaching methods, so students do not lose interest. This idea is supported by a study conducted by Pyne, Bates, and Turner (1995). They taught elementary mathematics to college students who did not reach the minimum requirements to be enrolled in a course they needed. The researchers determined that these students would be Math Anxiety 9 prone to having negative feelings of mathematics. In order to combat these feelings, they decided to concentrate on using different teaching styles, methods of assessment, and support sessions. They encouraged an investigative approach to mathematics. They wanted their students to be doing mathematics instead of listening to or watching the teachers do it. The teachers prompted the students to make their own decisions about what mathematics they needed. They encouraged thinking mathematically, and they used a variety of visual aids. Instead of the usual paper and pencil test, they used continuous assessment. The students were relieved when told that there would be no written exams. The class had a total of twelve teachers for only eleven students, so there were plenty of people to assist the students when they were having trouble understanding. This was especially useful when the students were performing open ended tasks. Overall, the students enjoyed the relaxed environment. They left the class feeling more confident about their own mathematical ability and their use of mathematics. This example demonstrates the effects that differing teaching styles can have on students' attitudes towards mathematics.

### **TEACHER ROLE IN REDUCING MATHEMATICAL ANXIETY**

The teacher can help his students overcome math anxiety. The mathematics teacher needs to be excited about teaching mathematics and he must believe that there is a reason for his students to learn the mathematics. If the teacher is not motivated to teach the subject, then one cannot expect his students to be motivated to learn it. It has been shown that students tend to internalize their instructor's interest in and enthusiasm for teaching mathematics (Jackson & Leffingwell, 1999). If the teacher is not happy about teaching mathematics or does not enjoy being with students in the classroom, then students are less likely to be motivated to learn the material. The teacher needs to be able to put himself in his students' shoes and remember what it was like to struggle with understanding new concepts (Schwartz, 2000). He needs to understand that it takes time for students to master concepts. Therefore, the teacher ... Math Anxiety 12 must have patience. He also should never give up trying to help his students succeed. He needs to give specific examples and applications of mathematics. The teacher should review basic mathematics skills with his students. Students need to be able to do the basics before they can move on to more complicated problems. Learning mathematics is a building block process. Each step builds on another one. It is imperative when teaching mathematics that the teacher progresses from simple problems to complex ones (Schwartz, 2000). Mathematics is a language all its own. It is full of definitions, vocabulary, symbols and notations that students must know in order to succeed in mathematics. Therefore, the teacher needs to make sure that his students can read and speak the language.

### **CONCLUSION**

Math anxiety is a real problem facing students, teachers, and parents. Students who have math anxiety face real and long-lasting consequences. Thankfully, there are real methods that teachers and parents can use to help

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students overcome their math anxiety. There are also ways of helping students realize their own math anxiety and work toward overcoming it. A better understanding of math anxiety is needed in order to help students overcome this problem. The more research is done, the more students, teachers, and parents will be able to work together to overcome this problem. As methods are found that help prevent and reduce math anxiety, the ideas and information should be shared so others can benefit from it as well. Mathematics is an extremely important subject and it is vital that students succeed in it.

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