

Coping With Math Anxiety

A Workshop for Students

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Two Scenarios

Imagine the following situation:

Recently I was eating in a restaurant in Austin where I sat next to a table of five people who looked to be in their mid twenties. The waitress brought them their bill and I could not help noticing that they were struggling to figure out how to divide it up and how much to leave for a tip. This went on for a while when finally one of them said: “Isn’t it funny that we are all graduate students and we can’t figure out the bill?”

Note: This really did happen on August 22, 2006 at Frank and Angie’s on 5th Street!

Now imagine this situation:

Five people walk into a restaurant and are seated. The waitress brings each of them a menu. They all sit quietly for a while until finally and one of them says: “Isn’t it funny that we are all graduate students and none of us can read these menus?”

Do you think that this is as likely to happen as the first scenario?

The point here is that everyone is aware of the importance of knowing how to read in our society, but very few view mathematics with nearly the same regard. Where it can be considered funny not to understand basic mathematics, it is usually considered to be quite embarrassing to be illiterate.

Definitions, Descriptions and Symptoms

General Anxiety:

- A feeling of unease, apprehension or worry. It may be associated with physical symptoms such as rapid heart beat, feeling faint and trembling. It can be a normal reaction to stress or worry or it can sometimes be part of a bigger problem.

<http://www.rcpsych.ac.uk/info/glosConds.htm>

- Anxiety is a complex combination of the feeling of fear, apprehension and worry often accompanied by physical sensations such as palpitations, chest pain and/or shortness of breath. Anxiety is often described as having cognitive, somatic, emotional, and behavioral components (Seligman, Walker & Rosenhan, 2001). The cognitive component entails expectation of a diffuse and uncertain danger.

<http://en.wikipedia.org/wiki/Anxiety>

Math Anxiety:

- A feeling of intense frustration or helplessness about one's ability to do math.

<http://www.mathacademy.com/pr/minitext/anxiety/>

- Math anxiety is an emotional reaction to mathematics based on a past unpleasant experience which harms future learning. <http://www.mathpower.com/anxtest.htm>

- An irrational fear of mathematics that can range from a simple discomfort associated with numerical operations to a total avoidance of mathematics and mathematics classes (Mathison, 1977). Mathematics anxiety has its roots in teaching and teachers and has been tied to poor academic performance of students, as well as to the effectiveness of elementary teachers (Williams, 1988)

- Math anxiety is described as “feelings of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations” (Richardson and Suinn, 1972, p.551).

- Intellectual factors that affect math anxiety include learning styles, persistence, self-doubt, and dyslexia (Harper and Daane, 1998; Trujillo and Hadfield, 1999).

- Math anxiety is an intense emotional feeling of anxiety that people have about their ability to understand and do mathematics. People who suffer from math anxiety feel that they are incapable of doing activities and classes that involve math. Some math anxious people even have a fear of math; it's called **math phobia**. The incidence of math anxiety among college students has risen significantly over the last decade. **Many students have even chosen their college major in the basis of how little math is required for the degree.** Math anxiety is an emotional, rather than intellectual, problem. However, math anxiety interferes with a person's ability to learn math and therefore results in an intellectual problem. : <http://www.counseling.swt.edu/bro/math.htm>

References

Seligman, M.E.P., Walker, E.F. & Rosenhan, D.L. (2001). *Abnormal psychology*, (4th ed.) New York: W.W. Norton & Company, Inc.

Mathison, M. (1977). Curricular interventions and programming innovations for the reduction of mathematics anxiety. Retrieved on October 1, 2001 from ERIC database (#ED154430).

Williams, W. V. (1988, February). Answers to questions about mathematics anxiety. *School Science and Mathematics*, 88, 95-104.

Harper, N., & Daane, C. (1998). Causes and reduction of math anxiety in preservice elementary teachers. *Action in Teacher Education*, 19(4), 29-38.

“Factors” That May Contribute to Math Anxiety

(Pun intended)

X Prior negative experiences with math. These may be related to one or more of the following:

- Bad grade school and/or high school teachers
- Lack of encouragement from parents (or teachers)
- Lack of positive role models
- Ethnic and/or gender stereotypes
- Math problems being used as punishment in grade school

(According to Sheila Tobias, millions of adults are blocked from professional and personal opportunities because they fear or perform poorly in mathematics. For many, these negative experiences remain throughout their adult lives.)

☹ The pressure of taking timed tests

X The fear of looking or feeling “stupid” in front of others

X Students being placed at the wrong ability level in their math courses

- Too high: The student will likely feel overwhelmed and intimidated.
- Too low: The student may feel frustrated by the pace of the course.

X Lack of preparedness

- This will cause anxiety in just about any situation!

X Can you think of any others?

Some Quotes from Students

“Some people can do math – not me!”

“When I look at a math problem, my mind goes completely blank. I feel stupid, and I can’t remember how to do even the simplest things.”

“In math there’s always one right answer, and if you can’t find it you’ve failed. That makes me crazy.”

“Math exams terrify me. My palms get sweaty, I breathe too fast, and often I can’t even make my eyes focus on the paper. It’s worse if I look around, because I’d see everybody else working, and know that I’m the only one who can’t do it.”

“I’ve never been successful in any math class I’ve ever taken. I never understand what the teacher is saying, so my mind just wanders.”

“I’ve hated math ever since I was nine years old, when my father grounded me for a week because I couldn’t learn my multiplication tables.”

“When I was little my father, who was a math teacher, used to punish me by forcing me to do math problems.”

-This quote was from a former intermediate algebra student of mine in the spring of 2005.

“Sometimes I do problems my own way. Even though I would get the right answer my teacher in high school would not give me credit because I didn’t do it the way he showed us.”

-This quote was from a former elementary algebra student of mine in the summer of 2006.

“I remember my seventh grade teacher. She didn’t care. She couldn’t be bothered with me because I was too slow. I just didn’t understand what she was trying to say. She would pass over me. Sometimes I would go after school and ask her for help. But she couldn’t help me. She would just dismiss me and I was left in a fog.”

“When I started college, I thought I would be pre-med and take chemistry and physics and all that. One summer I thought I would go through a chemistry book to learn what basic math I needed. I opened it and never got past the first two or three pages. After that I majored in history.”

Some of the above quotes are from: <http://www.mathacademy.com/pr/minitext/anxiety/>

Quotes from Mathematicians, Philosophers and Others

Note: I've chosen most of these quotes mainly to give a flavor of how mathematicians view their craft, and to spark discussion. Some of them however, were chosen simply show that even mathematicians have a sense of humor about math. Others were chosen only because they sounded interesting or were from interesting people.

Poor teaching leads to the inevitable idea that the subject (mathematics) is only adapted to peculiar minds, when it is the one universal science, and the one whose ground rules are taught us almost in infancy and reappear in the motions of the universe. – H.J.S. Smith, 19th century mathematician

Students must learn that mathematics is the most human of endeavors. Flesh and blood representatives of their own species engaged in a centuries long creative struggle to uncover and to erect this magnificent edifice. And the struggle goes on today. On the very campuses where mathematics is presented and received as an inhuman discipline, cold and dead, new mathematics is created. As sure as the tides. – J.D. Phillips

The Universe is a grand book which cannot be read until one first learns to comprehend the language and become familiar with the characters in which it is composed. It is written in the language of mathematics. – Galileo

The above quotes are from: <http://www.mathacademy.com/pr/minitext/anxiety/>

Do not be troubled by your difficulties with Mathematics, I can assure you mine are much greater. - Albert Einstein

"Since the mathematicians have invaded the theory of relativity, I do not understand it myself any more." -- Albert Einstein

Music is the pleasure of the human soul experiences from counting without being aware that it is counting. - Gottfried Leibniz

It is hard to convince a high-school student that he will encounter a lot of problems more difficult than those of Algebra and Geometry. - Edgar W. Howe

A mathematical truth is neither simple nor complicated in itself, it is. - Emile Lemoine

"The infinite! No other question has ever moved so profoundly the spirit of man." -- David Hilbert

The notion of infinity is our greatest friend; it is also our greatest enemy of our peace of mind. - James Pierpont

The above quotes are from: <http://members.cox.net/mathmistakes/quotes.htm>

"There is no Royal Road to Geometry." -- Euclid

"A mind is a fire to be kindled, not a vessel to be filled." -- Plutarch

"The more you know, the less sure you are." -- Voltaire

"Algebra is generous; she often gives more than is asked of her." -- D'Alembert

"Pure mathematics is, in its way, the poetry of logical ideas." -- Albert Einstein

"A mathematician who is not also something of a poet will never be a complete mathematician." -- Karl Weierstrass

"Black holes are where God divided by zero." -- Steven Wright

"Math class is tough." -- Talking Barbie Doll (1992)

"It is clear that the chief end of mathematical study must be to make the students think." -- John Wesley Young

"Only professional mathematicians learn anything from proofs. Other people learn from explanations." -- Ralph Boas

"Mathematics is not a spectator sport!" -- Unknown

"The Good Lord made all the integers; the rest is man's doing." -- Leopold Kronecker

"There are two ways to do great mathematics. The first is to be smarter than everybody else. The second way is to be stupider than everybody else -- but persistent." -- Raoul Bott

"Mathematics consists in proving the most obvious thing in the least obvious way." -- George Polya

"Obvious is the most dangerous word in mathematics." -- E.T. Bell

"Mathematics is written for mathematicians." -- Copernicus

"I was x years old in the year x^2 ." -- Augustus De Morgan (when asked about his age)

"42.7% of all statistics are made up on the spot." -- Steven Wright

"In mathematics, you don't understand things. You just get used to them." -- Johann von Neumann

"A man is like a fraction whose numerator is what he is and whose denominator is what he thinks of himself. The larger the denominator, the smaller the fraction." -- Tolstoy

"Mathematics is no more computation than typing is literature." -- John Allen Paulos

"One's work may be finished some day, but one's education never." -- Alexandre Dumas

"I write rhymes with addition and algebra, mental geometry." -- Ice-T

"Nature's great book is written in mathematics." -- Galileo

"Numbers constitute the only universal language." --Nathanael West

"Getting the degree meant more to me than an NCAA title, being named All-American or winning an Olympic gold medal." -- Patrick Ewing

"Five out of four people have trouble with fractions." -- Steven Wright

"To learn, you must want to be taught." – Proverbs 12:1

"Failure is the opportunity to begin again, more intelligently." -- Henry Ford

"The lottery is a tax on people who are bad at math." – unknown

The above quotes are from: <http://www.pen.k12.va.us/Div/Winchester/jhhs/math/quotes.html>

Math Myths and Misconceptions

- ✓ In order to be good at math you must have a mathematical mind.
- ✓ Mathematical ability is dependent on one's gender and ethnicity.
- ✓ There is always a best way to do a math problem.
- ✓ One must always follow the procedures set down by the teacher or textbook.
- ✓ One should never count on their fingers or use any type of manipulative aids when doing math.
- ✓ Mathematicians always do math quickly and in their heads.
- ✓ Math is done by working intensively until the problem is solved.
- ✓ Math must be done quickly. If you can't solve a problem in a few minutes, you should give up.
- ✓ Math is exact, logical and rigid. Intuition and Imagination are not part of mathematics.
- ✓ There is no creativity or imagination in doing math.
- ✓ Math mainly involves a lot of memorization of facts, formulas and procedures.
- ✓ Math is not relevant to my life.
- ✓ Math is mainly arithmetic.
- ✓ Math is boring.

Some Thoughts on Learning Math (Page 1 of 2)

- ✓ Math requires different study processes. In other courses, you learn and understand the material, but you seldom have to actually apply it. When learning math you have to work on the problems. It is seldom possible to absorb the material in a math course properly without actively participating. Just like learning to play music, repetition is often necessary in order to become “fluent” at the material.
- ✓ Math is a comprehensive learning process. What is used one day is used the next, and so forth. For example, in a history class you can learn chapter 2 and not 3 and do OK on 4. However, in math, you must understand the material in chapter 1 before you go on to chapter 2. Students often run into severe difficulties when they move onto a new concept before properly mastering the previous concepts. For this reason, it is helpful for the student to honestly ask and answer the following question before moving on:

“Do I **really** understand what I have just learned?”

There is no reason to lie when you answer this question because you will only be lying to yourself. Moving on to new material too soon is like building a house on a foundation of sand, sooner or later it (you) will collapse.

- ✓ Do your studying regularly (nearly every day if possible). It is much better for one’s memory process to study regularly in reasonable intervals than to study for many hours all at once. This may require that you make compromises in your weekly schedule in order to accommodate regular study patterns.
- ✓ Math is much like a foreign language. It must be practiced every day, and often the vocabulary is unfamiliar. Very often an English (or some other spoken language) word or phrase can have far different meanings in mathematics. For example, think of how different the meanings of these English words are in the context of math:

POSITIVE, NEGATIVE, REAL, IMAGINARY, COMPLEX, EVEN, ODD

- ✓ Math at a college or university is different from math in high school. Instead of going to class everyday, in college you go only two or three times a week. What took a year to learn in high school is now covered in only fifteen weeks. If you are new to the college experience you should realize that it may take some time to adapt to the way things are done.

Some Thoughts on Learning Math (Page 2 of 2)

- ✓ No learning situation is perfect for all (if any) students. You may need to be prepared to adapt your own learning style to coexist with the way your course is being presented. Different people learn in different ways and your way may not be synchronized with your teacher's style of teaching. If this happens **it is important that you ask questions** so that you have a better chance of getting an explanation that works for you. Most professors are appreciative to have this type of interaction with their students, so don't be shy! In short, you should be prepared to actively pursue your math education.

- ✓ Use the internet! There are vast resources out there to help you learn math as well as conquer your math anxiety. Many teachers and professors around the world have developed web-sites dedicated to helping students succeed at all levels of math. In fact much of the research for this workshop was done via the web.

- ✓ Try to schedule your math class at a time of day when you are most capable of learning. For example, some people learn best early in the morning while others may learn better in the afternoon.

- ✓ One should never read a mathematics book or notes taken in a math course the same way one reads a novel. You should sit at a desk, with paper and pencil in hand, verifying statements that are less than clear and inserting question marks in margins so that you will be ready to ask questions when you have the opportunity. The main point here is that learning math properly requires active participation in and out of the classroom.

Tips on How to Control Math Anxiety

- ✓ Get placed in the proper level course for your abilities. Make the advisors do their job. If you aren't satisfied with the advising, go and consult with a math professor.

Link to ACC's advising office: <http://www.austincc.edu/support/advising/index.php>

- ✓ Try to choose a professor who you think you can learn effectively from. Talk to your fellow students or try Pick-a-Prof on the ACC website.
- ✓ Ask questions in class as soon as you begin to become lost. Ask your teacher, a tutor in the learning lab or a trusted friend to help you with the concepts that you don't get. Do not try to ignore gaps in your understanding because they will come back to haunt you.
- ✓ Try to be an active learner rather than a passive one. Take control of your own education as much as possible. The more empowered you feel, the less intimidated you will feel when you encounter unfamiliar material.
- ✓ Be as well prepared as possible. Read the material for the next lecture ahead of time. This will allow you to focus more deeply on the lecture as it unfolds.
- ✓ Being well prepared for exams can greatly reduce your test anxiety. If you come into an exam with a feeling of preparedness you will be less likely to experience the physical effects of anxiety. Your heart will beat at a normal rate!
- ✓ Do your homework! Sometimes there is no substitute for good old hard work. The more problems you work out on your own, the more comfortable you will be during class and during exams. Don't get discouraged if you don't get every homework problem right. Persistence almost always pays off when it comes to math.
- ✓ Resist the temptation to measure your math abilities against those of your classmates. Learning math is not a competition!
- ✓ Try using "T-notes" when you do your homework. T-notes are also known as divided page notes.
- ✓ Learn your fractions! Fractions are commonly a huge source of frustration in mathematics. Be patient and learn them thoroughly.
- ✓ Write neatly and deliberately on exams and assignments. You would be surprised at how helpful this simple idea can be.

Math Study Skills Inventory

Rate your achievement of the following statements by placing a 3 for almost always, 2 for sometimes, and 1 for almost never. If you have never even thought about doing what the statement says, put a 0.

Selecting a math class

- _____ 1. I schedule my math class at a time when I am mentally sharp.
- _____ 2. When I register for a math class, I choose the best instructor for me.
- _____ 3. If I have a choice, I select a math class that meets three or four days a week instead of one or two.
- _____ 4. I schedule the next math class as soon as possible after I have completed the current course.
- _____ 5. I am sure that I have signed up for the correct level math course.

Time and place for studying math

- _____ 6. I study math every day.
- _____ 7. I try to start working on my math homework immediately after math class.
- _____ 8. I have a specific time to study math.
- _____ 9. I have a specific place with few distractions to study math
- _____ 10. I work on my math homework in the lab where I can get help.
- _____ 11. I am careful to keep up to date with math homework.
- _____ 12. I study math at least 8 to 10 hours a week.

Study strategies for math class

- _____ 13. I read my textbook before I come to class.
- _____ 14. If I have trouble understanding the text, I find an alternate text.
- _____ 15. I take notes in math class.
- _____ 16. I am careful to copy all the steps of math problems in my notes.
- _____ 17. I ask questions when I am confused.
- _____ 18. I go to the instructor or lab when I am confused.
- _____ 19. I try to determine exactly when I got confused and exactly what confused me.
- _____ 20. I review my notes and text before beginning homework.
- _____ 21. I work problems until I understand them, not just until I get the right answer for homework.
- _____ 22. I use flashcards for formulas and vocabulary.
- _____ 23. I develop memory techniques to remember math concepts.

Math tests

- _____ 24. I preview the test before I begin.
- _____ 25. Before I begin the test, I make notes on things such as formulas that I might need.
- _____ 26. I begin with the easy questions first.
- _____ 27. I take the full amount of time allotted for the test.
- _____ 28. I carefully check or rework as many problems that I have time to before I turn in my test.
- _____ 29. When tests are returned, I keep alog of the types of mistakes I make on tests: concept errors, application errors, or careless errors.
- _____ 30. I keep up to date so that I don't have to cram the night before a test.

Anxiety

- _____ 31. I believe that I can succeed in math class.
- _____ 32. I have study partners in my math class.
- _____ 33. I take practice tests.
- _____ 34. I know several good relaxation techniques.

_____ TOTAL SCORE

Scoring:

Total the scores from all 34 statements.

If your score is 90 - 103, give yourself an A. You are using the study skill you need in order to be successful in math.

If your score is 80 - 89, give yourself a B. You are using good math study skills. Choose a few strategies to work on each day, and you are well on your way to an A.

If your score is 70 - 79, give yourself a C. Your study skills are average. If you want an A, choose one or two strategies in each category to work on until you are using most of the strategies described above.

If your score is below 70, you are probably having a difficult time in math class. Math may not be your trouble! More than likely, your main problem is the study strategies you are using (or not using). Make yourself do the things on the list above.

This information can be found on page 117 of The Study Skills Workbook, third edition, by Dr. Carolyn H. Hopper, Learning Strategies Coordinator, Middle Tennessee State University. <http://www.mtsu.edu/~studskl>

Do You Have Math Anxiety?

Choose from the scale of 1 to 5 on the right. Where 5 corresponds to strong agreement with the statement and 1 corresponds to little or no agreement with the statement.

- | | |
|-------------------------------------------------------------------------------------|-----------|
| 1. I become physically agitated when I have to go to math class. | 1 2 3 4 5 |
| 2. I am fearful about be asked go to the board in a math class. | 1 2 3 4 5 |
| 3. I am afraid to ask questions in math class. | 1 2 3 4 5 |
| 4. I am always worried about being called on in math class. | 1 2 3 4 5 |
| 5. I understand math now, but I worry that it's going to get really difficult soon. | 1 2 3 4 5 |
| 6. I tend to lose my concentration in math class. | 1 2 3 4 5 |
| 7. I fear math tests more than any other kind. | 1 2 3 4 5 |
| 8. I'm afraid I won't be able to keep up with the rest of the class. | 1 2 3 4 5 |
| 9. I don't know how to study for math tests. | 1 2 3 4 5 |
| 10. It's clear to me in math class, but when I go home it's like I was never there. | 1 2 3 4 5 |

If you score in the 40-50 range it is likely that you have math anxiety to some extent. You should use the results of this survey to help you to understand your current attitude toward math. Do not consider a high total to mean that you are hopeless and will always feel this way. Try to apply some of the things that you have learned in this workshop and then retake this survey at the end of the semester. Hopefully, your total will be lower and your feelings toward math will have improved.

A note of caution about these types of surveys:

Just because a survey indicates that you may have math anxiety, using this as an excuse for failure can be just as damaging as the math anxiety itself.

Suggested Reading

Math Anxiety:

Overcoming Math Anxiety by Sheila Tobias, W.W. Norton & Company, 1993.
ISBN 0-393-31307-7

Mind Over Math: Put Yourself on the Road to Success by Freeing Yourself from Math Anxiety by Dr. Stanley Kogelman and Dr. Joseph Warren, McGraw-Hill, 1979.
ISBN 0-07-035281-X

Fear of Math: How to Get over It and Get on With Your Life by Claudia Zaslavsky, Rutgers University Press, 1996.
ISBN 0-8135-2090-8

Conquering Math Phobia: A Painless Primer by Calvin C. Clawson, John Wiley and Sons, 1991.
ISBN 0-471-52898

History of Mathematics:

A Concise History of Mathematics by Dirk J. Struik, Dover Publications, 1987.
ISBN 0-486-60255-9

Agnesi to Zeno: Over 100 Vignettes from the History of Math by Sanderson Smith, Key Curriculum Press, 1996.
ISBN 1-55953-107-X

Mathematical Interest:

Innumeracy: Mathematical Illiteracy and its Consequences by John Allen Paulos, Hill and Wang, 2001.
ISBN 0-8090-5840-5

The Joy of Mathematics: Discovering Mathematics All Around You by Theoni Pappas, Wide World Publishing, 1991.
ISBN 0-933174-65-9

Web Sites:

<http://www.mathacademy.com/pr/minitext/anxiety/>

<http://www.mathpower.com/anxtest.htm>

<http://mtsu32.mtsu.edu:11064/anxiety.html>

http://www.albion.edu/asc/QSC/math_anxiety.asp

<http://www.pen.k12.va.us/Div/Winchester/jhhs/math/quotes.html>

<http://abcnews.go.com/Technology/WhosCounting/>