Helping Students with Math Anxiety

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Getting Started

- Write down one specific thing about math that causes you anxiety or...
- One thing you’ve had students tell you about math anxiety.
The Nature of Math Anxiety

“People who don’t like math, don’t like to talk about math. Part of their avoidance mechanism is to pretend that it does not exist. But math does not go away. People need it at work, in calculating percentages, in dining out, and in handling money.”

Overcoming Math Anxiety, page 240
Tobias, Sheila
W. W. Norton & Company, 1993
The Nature of Math Anxiety

• “Math anxious adults can recall with appalling accuracy the exact wording of a trick question or the day they had to stand at the blackboard alone, even if these events took place thirty years before.”

• “The first thing people remember about failing at math is that it felt like sudden death.”
“If you see a decimal point, move it; if you see a fraction, invert it; if you see a sign, change it.”

“What I learned in ten years of school mathematics was what to do when I remember what to do. What I really needed to know was what to do when I forgot.”
Purpose

- To discuss math anxiety
- To dispel myths about math anxiety
- To change attitudes toward math
- To determine how to best work with students who experience math anxiety
Resources

- Banishing Math Anxiety by Sheila Tobias and Victor I. Piercey (2013)
- Overcoming Math Anxiety* by Sheila Tobias (1993)
- Numerous workshops and training sessions
- Classroom and tutoring experience

*originally written in 1978
Common Myths

• Myth 1: Mathematical ability is inherent. (either good in English or good in math and science but not both)
• Myth 2: Mathematical insight comes instantly if it comes at all.
• Myth 3: Only the very few can do mathematics.
• Myth 4: Mathematics is a male domain.

These often become excuses to fail.
About the Myths

- Hundreds of studies have found that perceived incompetence is actually a result of believing these myths.
- Often anxiety, rather than incompetence, controls students’ academic choices.
Research has found that...

“As long as parents, teachers, athletes, and entertainers publicly indulge in fear or indifference to mathematics, and as long as people who succeed in mathematics claim an innate superiority over people who don’t, the myths surrounding mathematics and the math anxiety that is a consequence of these myths will probably not go away.”
So what is needed to be successful in math?

- Confidence
- Persistence
- A taste for hard work
- “Math Mental Health – the willingness to learn the math you need when you need it.”

Overcoming Math Anxiety, page 12
Tobias, Sheila
W. W. Norton & Company, 1993
My Story – A Calculated Decision

- 1st grade
- Senior year
- College
- Career
The Facts

“Societal expectations affect attitudes, attitudes affect performance, and performance affects willingness to study more.”

“Math is difficult because it is rigorous and complex.”

“As we advance in math, the notation becomes abstract and general. This adds to its mysteriousness.”
Two Messages for our Students

- Students can take charge of their learning.
- Math continues to be needed outside the classroom.
An Example

“What is the net gain to a college if it raises tuition by a certain amount?

- On the one hand, the college will collect more money per student.
- On the other hand, a number of parents will decide not to send their children to that college.
- Also, the amount of financial aid given to students will have to be increased to meet the higher tuition rate (which will reduce the net gain to the college).
In addition, the cost of recruiting students will increase. 
To predict the effect of this decision, it would be useful to simulate the situation with a model that reflects the revenues, the expenses, the public-relations impact, the loss of some proportion of applicants, and all the other consequences of the action.”
Why bother?

“Today, even if college-level algebra and statistics are not in the job description, they will give you an edge on the competition later on for promotions into management or work in more interesting technical areas.”
Questions, Comments, or Observations...

- Are brief questions or statements that facilitate the understanding of everyone,
- Take less than one minute to state or ask,
- Avoid long descriptions of what is done in your line of work.
Questions or comments?

Banishing Math Anxiety
Tobias, Sheila and Piercey, Victor I.
Perhaps...

- Math anxiety is more about a failure of nerve rather than a failure of intellect.
Three-part system in brain

- Input area
- Memory bank
- Understanding and recall pathways connecting input area and memory bank
Those **without** math anxiety

- Try to make sense of wording
- Call up from memory right formula or approach and solve
- If stuck, re-think, re-read, return to memory bank
- Move back and forth along process pathways until know how to solve
- **BOTTOM LINE:** Keep busy moving mind along pathways.
Roadblock to Success

Math anxiety allows emotions to get in the way and interrupt the pathways.
Brain Diagram with Anxiety

[Image of a brain with pathways and labels: Process Pathways, Memory, Input Area, Math Problem Entered, Problem not Solved]
Those with math anxiety

- See math and panic.
- Emotions interrupt and clutter pathways.
- Can’t think. Lose confidence.
- “This is just the kind of problem I can never solve.”
- Doubt intelligence.
- Brain freezes.
- Problem: Can’t think because working has stopped.
Managing Math Anxiety

• Take charge of math learning.
• Talk about math. (heart of treatment)
• Stop being intimidated by lack of confidence.
• Stop being intimidated by “hallowed traditions” of math classrooms that keep students from feeling good.

Overcoming Math Anxiety, page 226 & 240
Tobias, Sheila
W. W. Norton & Company, 1993
Managing Math Anxiety

SPECIFIC STEPS

• Active thinking
• From self-monitoring to self-mastery
• Giving yourself permission
• Self-mastery
Active Thinking

- Thinking in mathematics involves doing.
- Teachers can’t teach math without DOING math on the board.
- They know something: only by trying new paths of thought, putting down one idea and then another, drawing diagrams, doing calculations, checking and rechecking can one learn math and solve problems.
From Self-monitoring to Self-mastery

- Recognize when panic starts.
- Know what form it takes.
- Un-panic systematically.
One Tool for Self-monitoring

- Divided page exercise – Ideas (feelings and thoughts) and solutions (math notes, calculations, problem solving steps)
- Will take several tries
- Eventually recognize pattern of thinking when under stress
- Once identified, better chance to rid anxiety
- Leads to self-mastery
The Secret

- The essence of doing math is not to stop but to keep going.

- The essence of math anxiety therapy is self-monitoring.
Giving yourself permission

- Divided page practice leads to exploring confusion and what makes math so hard
- Become familiar with learning style and learning pitfalls
- Even if filling up “ideas”, at least still doing
- Ability to analyze resistance becomes source of insight into solving math problems!
Self-mastery

- Writing things down prevents almost paralyzing effort of staring at a problem or page in a book
- Remember: *Thinking* in mathematics involves *doing*.
- Students who are successful in math or not necessarily smarter than the rest of us, but they know themselves well.
Questions or comments?
Using Resources

- Human resources
- Textbook
- Online resources
Human Resources

- Instructor
  - Visit in office within first two weeks; introduce self; go back often
  - Establish relationship
  - Have an agenda/plan/specific question

- Classmates
  - Fellow travelers on journey
  - Form study groups

- Tutors
Textbook

- Reading a math text is unlike reading other textbooks.
- Read slowly.
- Read summaries at the end of each section or chapter.
- Study everything on the page. Do not skim or skip diagrams or graphs.
- Read and study examples.
- Write/mark in the book.
Two Options for Reading a Textbook: Down or Up

Reading Down.

- Most common
- From overview to examples
- Hint 1: Try to think of examples while you read rather than just memorizing.
- Hint 2: Read aloud to a study partner or friend to help with possible misunderstandings.
Two Options for Reading a Textbook: Down or Up

Reading Up.
- Text used only as a reference.
- Read examples & solutions first.

or

- Try assigned problems using current skills.
- Read as needed for help.
Online Resources/My Labs

- Take a tour/tutorial to become familiar with features.
- Watch videos provided.
- Access online textbook.
- Use personalized study plan.
- Watch deadlines.
Study Suggestions

When has one studied enough?

- Good sign: When working problems, getting right answers often and understanding what is wrong with those missed
- Confident? Alert?
- Review. Does it look easy?
If studying isn’t going well...

Diagnose the problem.

• Understand material as written?
  Try reading up.

• Think understand but can’t work problems?
  Review guidelines and ask for help. Take work done.

• Read, comprehend, do homework, but can’t put it all together for test?
  Get with a study group!
Tools of the Trade

- Don’t give up!
- Know how to use calculator. Go to help sessions or ask instructor.
- Use online tools.
- To prepare for tests, work problems without getting immediate feedback as to right or wrong.
- Work problems, re-work problems, and work again. PRACTICE! PRACTICE!
Study Groups

“Studying in a group is the most effective way to learn and retain what you’ve learned.”

- Find or form a study group, people who will work well together and respect each other.
- Set a regular meeting time.
- Start early in the semester.
- Establish ground rules.

Banishing Math Anxiety, page 75
Tobias, Sheila and Piercey, Victor I.
Teamwork

Most mathematics instructors only made it through their college math classes by “practicing with teammates”...in a study group.
Math & the Workplace

- Pre-Employment Testing
  - Paper and pencil
  - Online
  - Read the small print! Find out if penalized for guessing.

- Math on the Job
  - Healthcare: blood pressure, pulse rate, conversions,...
  - Realtor or construction: length, width, area, volume,...
  - Chef: units of measure, proportions,...
  - Almost all jobs use data at some point!!
So what can we do?

- It’s important to be aware of what we, as professionals, say and do.
- Be aware of our attitudes toward math.
- Do not promote the myths!

Banishing Math Anxiety
Tobias, Sheila and Piercey, Victor I.
Responses – Do’s and Don’ts

- Find common ground.
- Point to the “light at the end of the tunnel.”
- Encourage to utilize ALL resources: instructor, textbook, tutoring, etc.
- Encourage without making grand predictions.
Responses – Do’s and Don’ts

- Don’t scold or demoralize.
- Don’t tell them, “I hate math, too!” without sharing that you passed what was required to get your degree.
- Don’t let them use family, friends, or you as a crutch as to why they “can’t” do math.
In Summary

- No single book or help session can transform anxiety.
- Our main goal should be to encourage students to have the willingness to learn the math needed when needed.
- Does one have to think like a mathematician in order to do math? NO!
- Be willing to ask for help.
In Summary

“Remember: it took thousands of years for the very best minds, working over time, to create the mathematical ideas ordinary college students learn today. That legacy should not be a burden to us, but should be taken for what it is: a gift! And above all it should be accepted, not avoided or left unexplored.”
Questions or Comments?

Banishing Math Anxiety
Tobias, Sheila and Piercey, Victor I.
Catholic School

• A couple has a son who is struggling in school, especially in math. They decide to enroll him in a catholic school and see if his grades improve.

• He comes home everyday, goes straight to his room to do homework, and is very serious about his school work.
Catholic School

- The son brings home his first report card from the catholic school and he has an “A” in MATH!
- His parents are ecstatic but ask, "Why are your math grades suddenly so good?"
"You know", the son explains, "when I walked into the classroom the first day, and I saw that guy on the wall nailed to a plus sign, I knew one thing: This place means business!"
Thanks for coming!

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