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**Cover Page Footnote**
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# A Math Therapy Exercise

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**Synopsis**

Math anxiety prevents many liberal arts undergraduates from appreciating mathematics and realizing their potential in math courses and math-related endeavors. The author describes his development and use of a "math therapy exercise" that enables students to move beyond the paralyzing grip of math anxiety and cultivate a more positive relationship with mathematics.

I will always remember that first meeting of the very first math course I taught at Prescott College in 1990. Two of the nine enrolled students came separately to the classroom door to tell me they were sorry but they just could not enter a math classroom because of feeling so much anxiety from past experiences trying to learn math. That is when I knew that teaching general mathematics at a progressive student-centered liberal arts college might be more challenging than anticipated.

Having just finished a master's degree that focused on alternative pedagogies for adult learners, and with three years of prior experience teaching math courses at the local community college, I expected to be in my element teaching mathematics at Prescott College. Then the first thing I encounter is students telling me they are too traumatized to enter my classroom! Nothing from my graduate studies had prepared me for this.

I talked with the traumatized students and told them I would provide a special activity that would help with their math anxiety, if they would please just come into the classroom. I actually had no idea what this "special activity" would be; I was just trying to get the students to come to class. When these students did return I spontaneously asked all of the students to journal about their past experiences with math, and then I invited them to share whatever they wished with the rest of the class. To my surprise

all of the students shared poignant negative past experiences, and they all validated and supported one another beautifully during the discussion. The two traumatized students discovered they were not alone and opened up to the course, with everyone experiencing success in the course. Thus was born the math therapy exercise that has become the mainstay of every first meeting of every math course I have taught since 1990.

The current form of this math therapy exercise invites students to address six topics.

- My earliest memory or memories of math.
- When and why math became difficult for me (if it did become difficult).
- My worst memory or memories of math.
- My best memory or memories of math.
- How I really feel about math.
- How I really feel about taking this course.

After journaling extensively students are invited to share with the rest of the class as much of this narrative as they are comfortable sharing. Now that I teach in the Limited-Residency Undergraduate Program at Prescott College and my math courses are online, students share through an online forum.

While on the surface this may seem like an innocuous activity, I have witnessed hundreds of apprehensive students ease into my math courses with a new attitude of hope and openness rather than dread and anxiety, primarily because of it. Dredging up unpleasant math memories, processing them on paper, and then sharing them in a supportive peer environment can work wonders toward releasing the paralyzing grip of math anxiety.

The main course I currently teach is *Mathematical Explorations*, a humanistic math course that I created for undergraduate liberal arts students at Prescott College. Of course, not all liberal arts undergraduates suffer from math anxiety, but I have discovered through the math therapy exercise that a surprising number of them do. Based on what students write in this exercise, as indicated by the use of emotion-laden words like anxiety, aversion, afraid, intimidated, terrified, and traumatized, I estimate that well over half of the students I have taught in the past twenty-three years entered

my courses firmly in the grip of math anxiety. Even students who like math may have experienced something negative regarding math in their past. Of the 132 students who enrolled in *Mathematical Explorations* in the last two years, only four did not remember a negative past experience with math. This suggests that a math therapy exercise could be beneficial for virtually every liberal arts undergraduate.

The following is an example, taken from one of my recently completed courses, showing what the math therapy exercise looks like after students complete the initial journaling on the six topics above. I have condensed the initial journal narrative, with the responses given in their entirety.

Here is the initial journal narrative, posted to the Therapy Forum:

> "*My earliest memory of math was learning addition in elementary school alongside my sister. She was a natural at math. I don't remember struggling really with math, but I do remember feeling like I was not as good as my sister. So I decided at an early age to let my sister be the math/science child and I was the abstract/expressive child.*
>
> *As I sit here thinking about my academic career I begin to wonder if my aversion to math has more to do with this early decision to not be a "math kid" than actually struggling with the content of the subject. However, I know I have always struggled with sitting through any math course and almost never completed homework assignments without at least an hour of procrastination.*
>
> *I cannot help but wonder if my discomfort with math as a whole could have been avoided if 1) I did not fight studying math so fiercely as a young student, and 2) I did not bomb a math competition in fifth grade. Fifth grade was a hard year for me for many reasons including "the math incident." My teacher felt that the best way to learn math was to have students compete against each other. Two teams would be chosen, and then members of each team would stand up to be quizzed on math. Sadly, I was chosen to stand in front of the class to answer questions about the multiplication tables. My teacher asked me nine questions, of which I answered none of them correctly. My peers made fun of me for an entire week. From that day forward when I knew there was going to be another competition day I pretended to be sick.*

*Now that I am older I wish I had not let experiences from when I was younger impact my relationship with math. Mathematics seems so interesting to me when it is applied to engineering, computers, and other practical applications. I also feel a sense of loss when thinking about how I will never truly appreciate advanced math forms the way people do who had a richer experience with the subject. I hope taking this course will kindle something in me that was taken away at such a young age. I hope this class will allow me to become inspired by a subject I have spent so many years avoiding or suffering through.*"

Here are four student responses:

- "*Thank you for sharing your story with us. I too look back on my experiences with math and regret that it has impacted me so much.*"
- " *I understand that sense of regret for not pursuing more math education. I'd always assumed that my lack of math knowledge would keep me out of so many fields I had been interested in, especially the sciences. It's never too late to learn though!*"
- "*This exercise has really made me realize how those initial childhood experiences with math have affected me all of my life. I didn't have an older sibling to differentiate from, but I do remember those excruciating math contests: standing in front of the class and racing to get to the right answer before the other teams. I too pleaded sick if there was a math activity I knew about. Just remembering and sharing these experiences is releasing the trauma. How lucky we are to get to experience a different approach to math!*"
- "*Thanks for sharing your story. After reading everyone's assignments it really makes you realize what a lasting effect our first foundations and experiences of math have. With that, I think this assignment is a great way to start and I feel that this class will give us all who had struggles and math anxiety a new perspective.*"

This example illustrates two common outcomes of the math therapy exercise. First, the initial journal narrative does not just wallow in unpleasant math memories and regrets of a lost relationship with mathematics, but

rather processes those memories from an adult perspective that expresses hope for a new experience of appreciating math. Second, the responses to the initial journal narrative do more than just commiserate with the misfortune of shared unpleasant math memories, although such commiseration is an important part of the process. In addition to that, though, these responses turn naturally toward hope for a new experience with math in the future.

As the instructor, I find myself needing to do little or nothing to facilitate the process of this math therapy exercise. Students always seem to know what to do with this exercise in order to gain therapeutic benefit, as the above example illustrates. When I taught in the classroom, I only needed to move the discussion along as one would with any class discussion. With the online courses I do nothing except communicate privately with students to acknowledge the content of their journaling and express my own commitment for them to have a positive learning experience in our current course.

How well does this math therapy exercise actually work to reduce math anxiety? Though I have not tried to quantify its effectiveness, I receive ample anecdotal evidence about the value of this exercise. As with other courses at Prescott College, at the end of *Mathematical Explorations* all students complete a narrative self-evaluation as well as a course questionnaire that invites them to comment on what they found particularly helpful about the course. A recurring theme from these narratives is some variation of this sentiment expressed in a self-evaluation from my most recent class: "I no longer have a fear of math." Some students also offer unsolicited comments on some personal perceived benefits of the math therapy exercise. Following are four representative comments taken from my last two courses:

- "*By first addressing my math trauma and the conceptions about math that I developed in childhood. . . I was able to let go of my preconceptions and enter into a new relationship with math.*"

- "*Writing an essay about my math experiences not only helped me better understand my associated trauma, but inspired me to bring my best thinking to this class—even when I remained uncertain.*"

- "*In this course I was able to discuss my history, setbacks, and frustrations with math with my online peers in the math therapy essay. What I discovered was a lot of personal issues that stemmed from ego, doubt,*

*and anxiety... This exercise led me to discover how my reactions would lead to doubting my math ability and essentially not trusting myself with math. Reading my peers reactions to the exercise helped create a welcoming platform to approach this course.*"

- "*My mind was set at ease after exploring my path with past math anxiety in our first assigned paper [the math therapy exercise]. After reading my classmates' papers, although we all had different experiences, it felt as if we were all in it together.*"

Finally, I asked one of the students who participated in the above example of the Therapy Forum to respond briefly to this prompt: Now that you have completed *Mathematical Explorations*, please describe how you think the math therapy exercise benefited you, if at all, in that course. This student's response follows.

"*I was surprised to learn that many people shared traumatic experiences in their early math education. Simply knowing that others struggled as I did helped me feel supported, understood, and less intimidated as I went through the course. By expressing my fears and blocks about math, it released them and allowed me to recognize them but not be controlled by them. Throughout the course fellow students felt free to refer to early negative experiences, and I believe by recognizing the "elephant in the living room" we were all able to find a new connection and appreciation for math. As I have gone into other courses, my stress level with math is down and my confidence has gone way up. What was my most dreaded course became one of my favorites!*"

For me, teaching math courses to liberal arts undergraduates is as much about cultivating interest and appreciation for mathematics as it is about teaching content. With a small investment of class time, this math therapy exercise can create a positive, hopeful energy, both individually and collectively, that sets the stage for the rest of the course to be not only successful but also meaningful. Such a positive experience in one math course can completely change a student's negative attitude toward mathematics, with beneficial implications for future coursework and life endeavors.

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