Achievement Goals, Motivation to Learn, and Mathematics Anxiety among Pre-service Teachers

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Abstract

This paper reports findings of a pilot study examining the feasibility of a research design to investigate how achievement goals relate to the construct of math anxiety. In addition, we also consider how other important achievement-related behaviors, like self-efficacy, help-seeking, and self-regulation, might also relate to students' math anxiety. While math anxiety still remains a real issue affecting student performance and confidence, today it is more critical in our society with the greater emphasis on producing more students for careers in fields like Science, Technology, Engineering, and Mathematics (STEM). The total multiple regression model predicted a significant amount (43%) of the variation in math anxiety of participants.

Geist (2010) states that negative attitudes toward mathematics and what has come to be known as "math anxiety" are serious obstacles for young people in all levels of schooling today, and he feels that an anti-anxiety curriculum is critical in building students' confidence when working with mathematics especially in the light of a great push for more people going into the fields of Science, Technology, Engineering, and Mathematics (STEM). Helping students identify and address their math anxiety is critical in helping them cope with and overcome such anxiety that otherwise may negatively impact future choices in their academic and professional careers. As Boaler (2008) points out, it is critical to ensure students are confident and well prepared in mathematics if they are going to compete for such high-tech jobs today and in the future. Today, the United States is working to lead more young people into the STEM fields so we as a country can compete globally. Zollman (2012) believes that we need to evolve from learning for STEM literacy to using STEM literacy for learning to satisfy our societal, economic, and personal needs. If we are to build math confidence in our students, math teachers need to address head on the issue of math anxiety which often manifests itself as hesitancy or learned helplessness in observed math achievement.

Therefore, the purpose of this pilot study was to examine the feasibility of a research design intended to use in a larger-scale study examining how achievement goals relate to the construct of math anxiety and important achievement-related behaviors while learning math concepts.

Math Anxiety

Math anxiety may be defined as an *"...*inconceivable dread of mathematics that can interfere with manipulating numbers and solving mathematical problems within a variety of everyday life and academic situations" (Buckley & Ribordy, 1982, p. 1). The National Council of Teachers of Mathemtics (NCTM) (1989 & 1995b) recognized math anxiety as a problem and specifically included it in its assessment practices. Standard #10 (NCTM, 1989) prompts teachers to assess their students' mathematical dispositions; such as: confidence in using math to solve problems, communicate ideas, and reason.

As educators we need to know what causes this dread of mathematics so that it can be prevented and/or reduced. Causes of math anxiety may vary from socioeconomic status and parental background to the influence of teachers and the school system. Ahmed, Minnaert, Kuyper, &van der Werf (2012) examined the reciprocal relationships between self-concept and anxiety in mathematics. A sample of 495 grade seven students (51% girls) completed self-report measures assessing self-concept and anxiety three times in a school year. The analysis showed a reciprocal relationship between self-concept and anxiety in math (i.e., higher self-concept leads to lower anxiety, which in turn, leads to higher self-concept). Concluding that math self-concept and math anxiety are reciprocally related. Some educators believe that teachers and parents who are afraid of math can pass on math anxiety to the next generation, not genetically, but by modeling behaviors of their own discomfort with the subject. Research by Oberlin (1982) and Furner (1996) found that some teaching techniques actually cause math anxiety; (a) assigning the same work for everyone, (b) covering the book problem by problem, (c) giving written work every day, (d) insisting on only one correct way to complete a problem, and (e) assigning math problems as punishment for misbehavior.

Ineffective teaching practices are not the only cause of math anxiety. A student's lack of success with math may also be a cause of math anxiety and be heightened by any one of several factors: poor math instruction, an insufficient number of math courses in high school, unintelligible textbooks, or misinformation about what math is and what it is not. Many people often blame their failures on their lack of a mathematical mind, the notion that men are better than women at math, or that they have poor memories or learning disabilities. Sheila Tobias, an expert on the topic of math anxiety since the 1980's, contends that there are two myths about mathematics that need to be eliminated. One is that higher level math is too difficult for otherwise intelligent students to master, and another is that without mathematics you can live a productive intellectual and professional life (Tobias, 1993).

Willis (2010) gives over 50 strategies educators can use in any grade level to: (1) Rehabilitate negative attitudes about math; (2) Reduce mistake anxiety; and (3) Relate math to students' interests and goals. Having a better understanding of students' brains can help build foundational skills in math and other subjects and develop your students' long-term memory of academic concepts which can then prevent anxiety with mathematics.

A study by Perry (2004) indicated that 85% of students in an introductory college level math class claimed to have experienced anxiety when presented math problems. Jackson and Leffingwell (1999) showed another perspective in this study, with only seven percent of the

college students in their study not expressing math anxiousness. The prevalence of math anxiety in empirical studies is confounding; however, the effect of math anxiety is well documented. Even in populations of students where math is a foundational skill (e.g. engineering majors in college), researchers have found math anxiety to be present (Hembree, 1990; Ruffins, 2007). Sparks (2011) feels that as the STEM fields become more important for our students to study, our schools and teachers need to do more to address math anxiety so that our students are confident to study areas related to STEM. If math anxiety occurs frequently, then attention to the methods that are effective at overcoming math anxiety are important for teacher preparation as well as for in-service math teachers.

There are many things schools can do to help prevent math anxiety. Both teachers and parents play a critical role in helping to develop positive dispositions toward math. As with most intervention programs, early assessment and action help to develop positive math attitudes. The field of math education has recently made the push to increase and encourage math literacy, and along with that push has developed some useful materials to encourage math competence.

Reducing math anxiety is much different from preventing math anxiety. While every educator would like to prevent a student from experiencing math anxiety, some come to school already worried about being skilled at math. Ooten (2003) in her book, *Managing the Mean Math Blues*, outlines a four-step method for managing a persons' math anxiety. Ooten (2003) believes that a person who suffers from math anxiety needs to first lay the groundwork by coming to terms with their feelings and challenge their current beliefs and realize they are not alone; second, one must change their thoughts and negative thinking and use intervention strategies to improve one's thinking that they can be successful at math; third, one needs to know thyself, it is important that one knows his/her learning style/mode and that he/she applies approaches to doing math by successful people; and lastly fourth, once one has gained some confidence and strategies for doing mathematics they then must apply what they learned and actually do the math. All of Ooten's techniques require the teacher to first be aware and second to support the student in turning around their anxiety.

Math Anxiety among Preservice Teachers

Math anxiety exists in elementary education. Some studies have found that as high as 93% of preservice teachers express some anxiety, with anxiety beginning as early as the elementary school level (Jackson & Leffingwell,1999; Bekdemir, 2010; Dunkle, 2010; McAnallen, 2010; Blazer, 2011; Westenskow, & Moyer-Packenham, 2012). Many elementary education preservice teachers never took higher than a formal Algebra class or very many math classes as part of their studies to become a teacher (McAnallen, 2010). Some research has found that most elementary education majors reported having poor experiences with math courses in K-12 (Bekdemir, 2010; McAnallen, 2010). Other empirical studies discuss strategies that help in addressing math anxiety in preservice teachers like best practices such as cooperative groups, manipulatives, journal writing, and discussing feelings, clinical placements, etc. (Dunkle, 2010; Brown, Westenskow, & Moyer-Packenham, 2012).

Brown, Westenskow, and Moyer-Packenham, (2011) found that preservice elementary teachers' math anxiety may not necessarily always affect their math teaching anxiety. However, a

teacher's classroom behaviors, both overt and covert, during math instruction have proven to be influential on students' math anxiety (Jackson & Leffingwell, 1999). In addition, and critical to our line of research, is that a teacher's motivational goals towards learning can impact students' learning goals, self-efficacy, use of positive coping strategies, and willingness to seek help and ask questions (Butler & Shibaz, 2008; Friedel, Cortina, Turner, & Midgely, 2007). A topic we turn to in the coming sections.

Overcoming Math Anxiety

As can be seen from the above math anxiety literature, there are many motivational strategies that can be used to both reduce and prevent math anxiety which are in line with NCTM recommendations (1995a). Motivated learning strategies such as removing the importance of ego from classroom practice, emphasizing that everyone makes mistakes in mathematics and everyone has the capacity to improve, making math relevant, and letting students have some input into their own evaluations can be very useful in both preventing and reducing math anxiety and improving attitudes toward learning mathematics and then leading students to pursue a wider range of goals as it relates to future studies and career orientation. Synthesizing across this literature, it becomes apparent that many of these motivational strategies overlap with the research literature highlighting how influential a student's goal orientation can be to their learning. Therefore, of particular importance to this study was to look at research examining the relationships between preservice teachers' achievement goals and their levels of math anxiety. The next section introduces the goal constructs and reviews research that has examined how the goals that students' adopt relate to their anxiety and fear of failure with particular emphasis on those studies looking at math anxiety specifically.

Goal Orientation Theory

Goal orientation theory examines how the types of achievement goals students adopt are linked with important academic outcomes (Ames & Archer, 1988; Conroy & Elliot, 2004; Dweck & Leggett, 1988; Elliot, 2005; Elliot & McGregor, 2001; Ryan, Ryan, Arbuthnot, & Samuels, 2007; Sideris, 2008). Elliot and McGregor (2001) proposed a 2x2 conceptualization of achievement goals: performance approach goal, performance avoidance goal, mastery-approach goal and mastery-avoidance goal.

Students adopting performance goals are motivated to outperform others (performance-approach) or to avoid failure (performance-avoidance). Students adopting mastery-approach goals are positively motivated to master a task and advance one's learning; students adopting mastery-avoidance goals are negatively motivated to avoid misunderstanding and leaving a task un-mastered. While mastery-approach goals are related to deep processing, intrinsic motivation, and GPA; mastery-avoidance goals are related to disorganized studying, fear of failure, and test anxiety; performance-approach goals are linked to performance attainment but also sometimes to more surface-level processing; and performance-avoidance goals are positively linked to test anxiety and negatively linked to intrinsic motivation, exam performance, and GPA (Conroy & Elliot, 2004; Elliot, 2005; Finney, Pieper, & Barron, 2004; Furner & Gonzalez-DeHass; 2011; Ryan et al., 2007; Sideridis, 2008). Of particular interest to this paper is to tease apart how each of the goal constructs relates to math anxiety specifically.

Few published studies have actually examined the relationship between math anxiety and all four achievement goal constructs. Bong (2009) reported that elementary and middle- students with performance-approach, mastery-avoidance and performance-avoidance goals experienced more math anxiety (with the mastery-avoidance goal showing the strongest relationship with math anxiety). While mastery-approach goals appeared to be particularly beneficial, providing a stronger 'psychological armor', in combating adolescents' help-seeking avoidance and test anxiety in math classes. Putwain and Daniels (2010) examined how the relationships between test anxiety and competency beliefs are moderated by achievement goals among secondary mathematic students in England (ages between 11 and 12 years). Surprisingly, weak to moderate positive correlations were found between the test anxiety subscales of 'thoughts' (worrisome thoughts about a negative outcome for tasks) and 'autonomic reaction' (such as shaky hands during test-taking) and all four achievement goals, although effects were slightly stronger for both avoidance goals.

While not including all four goal dimensions in their analyses, a few additional studies have also examined the relationship between students' math anxiety and achievement goals using the earlier trichotomous framework (mastery goal and two performance goals). Middle school students' adoption of performance-avoidance or performance-approach goals was predictive of anxiety for math lessons (Skaalvik, 1997) and test anxiety in math (Middleton & Midgley, 1997). Zusho, Pintrich, and Cortina (2005) examined the relationships between the trichotomous framework of achievement goals and undergraduate students' motivational outcomes on math tasks and found that performance-avoidance goals were related to lower achievement scores, lower levels of competence, and higher levels of anxiety while mastery and performance-approach goals had positive outcomes for students' interest and competence perceptions.

Motivation to Learn

The achievement goal literature has uncovered that students' adoption of specific goals are linked with important motivational outcomes. Of particular interest to this study, are how achievement goals could be linked with students' self-efficacy, self-regulated learning, and help-seeking behavior and how this might shed light on students' math anxiety. In the trichotomous framework of achievement goals, mastery goals have been related to academic efficacy, self-regulated learning, deep processing, persistence and effort, help-seeking behavior, viewing learning tasks as a challenge and negatively predicting test anxiety; performance-approach goals have sometimes been linked to effort and persistence while studying, effective strategy use, and viewing learning tasks as a challenge, yet other times have been related to avoidance of help-seeking behaviors , and shallow or surface processing of information, and fear of failure and test anxiety (particularly in achievement situations that are perceived as a threat rather than an opportunity for challenge with little chance of failure); and performance-avoidance goals have been related to test anxiety, fear of failure, disorganized studying, surface processing, ineffective strategy use, procrastination, viewing learning tasks as a threat, and negatively related to task persistence, help-seeking, self-regulated learning, deep processing and academic efficacy (Cury, Elliot, Sarrazin, Da Fonseca, & Rufo, 2002; Elliot, 1999; Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Elliot, McGregor & Gable, 1999; McGregor & Elliot, 2002; Middleton &

Midgley, 1997; Rawsthorne & Elliot, 1999; Shih, 2005). Thus, implying that achievement goal perceptions may also relate to student discomfort or anxiety where mathematics is concerned.

Additionally, when separating the mastery goal construct, Bong (2009) reported that mastery-approach goals appeared to be particularly beneficial, providing a stronger 'psychological armor', in combating adolescents' help-seeking avoidance in math classes (particularly those confronted with competitive, ability-focused learning environments). Students with mastery approach goals are interested in learning new skills and improving their understanding and competence; they are engaged in the process, not focused on the product. They are taking responsibility for their learning and engaged in activities that allow for self-regulation and self-direction. Their success is defined by individual improvement, they place value on effort, and their satisfaction is gained from working hard and learning something new.

Research Objectives

The first objective was to investigate the feasibility of the proposed research design including recruitment strategies using an internet-based instrument and the validity and reliability of the instrument. The second objective was to examine the nature of relationships between mastery and performance goals and math anxiety, self-efficacy, self-regulated learning, and help-seeking among pre-service teachers learning math concepts. Existing research investigating the relationships between students' achievement goals and reported math anxiety points to the benefits of students adopting mastery-approach goals and the deleterious effects of students adopting performance-avoidance goals. Slightly more inconclusive, and worthy of further study, are the effects of students adopting the performance-approach and mastery-avoidance goals.

Method and Sample

The pilot study sample consisted of 30 undergraduate students enrolled in sections of MAE 4350, Principles & Methods: K-9 School Math who were18 years old or older; 27 were females. All students taking the MAE 4350 course are either elementary education majors or elementary special education majors taking the course as a requirement for completing their program as elementary school teachers. The students had taken two other college level math classes as pre-requisites for this math methods course, one being at least College Algebra. The students took this class in their last two years of upper-division course work and had taken other education courses prior to this class and were familiar with how to write lesson plans. A non-random sample was used, and all students enrolled were given the chance to participate. While information about ethnicity was not collected, the university the students belong to is ranked as 32nd nationally in the number of bachelor's degrees conferred upon minorities (FAU, 2012).

Instruments

An online survey was distributed and stored electronically through *Google.doc*. The online survey was composed by four components: The Achievement Goal Questionnaire (AGQ) by Elliot and McGregor (2001), the Motivated Strategies for Learning Questionnaire (MSLQ) by Pintrich, Smith, Garcia and McKeachie (1991), the Abbreviated version of the Mathematics

Anxiety Rating Scale (MARS) by Alexander and Martray (1989) and additional demographic questions on age, gender and preferences of study.

AGQ. The AGQ was developed by Elliot and McGregor (2001) and included twelve Likert-type items. Students had to indicate if they thought the statement was very true (7) or not at all true of them (1). The AGQ scale was found to have strong reliability Cronbach's coefficients for four subscales: performance approach goals (.92), performance-avoidance goals (.83), mastery avoidance goals (.89) and mastery approach goals (.87). In the current study, Cronbach's alphas were as follows: performance approach goals (.74), performance-avoidance goals (.75), mastery avoidance goals (.87) and mastery approach goals (.82).

MSLQ. The MSLQ was developed by Pintrich, Smith, Garcia and McKeachie (1991). Information on predictive validity and internal reliability coefficients were available from this questionnaire. While the original full MSLQ has two main sections (a motivation section and a learning strategies section, totaling 81 items), only three subsections were chosen based on the purpose of study. Thus, the summarized MSLQ version in the current study included self-efficacy for learning and performance (from the motivation section) with eight items, metacognitive self-regulation (from learning strategies) with 12 items, and help seeking (from learning strategies) with four items. All questions were Likert-type items and the items ranged from 7(very true of me) to 1(not at all true of them). The MSLQ scale was found to have strong reliability Cronbach's coefficients for four subscales: self-efficacy learning and performance (.93), metacognitive self-regulation (.79), resource management: help seeking (.52) and mastery approach goals (.87). In the current study, Cronbach's alphas were as follows: self-efficacy learning and performance (.94), metacognitive self-regulation (.8) and resource management: help seeking (.5).

MARS. Originally developed by Alexander and Martray (1989), the Abbreviated Version of the Mathematics Anxiety Rating Scale (MARS) provides a measure of anxiety associated with math testing and numerical operations, and of math courses. It is an internally consistent and reliable 25-item scale (Alexander & Martray, 1989). Its primary purpose being to create an abbreviated version of the lengthier, 98-item MARS. The result was an internally consistent and reliable 25-item scale. The creators of the Abbreviated Version of the MARS used items from the actual full-scale MARS and from the Fennema-Sherman Mathematics Attitude Scales (Fennema, 1976) to develop the Abbreviated Version of the MARS. The abbreviated version is much like the original in that it is multidimensional. The Abbreviated Version of the MARS measures mathematics anxiety--specifically math test, number, and math course anxiety. The internal consistency of the scale scores using the 25 salient items calculating coefficient alpha was .96 for the 15 items measuring test anxiety, .86 for the 5 items measuring numerical task anxiety, and .84 for the 5 items that tested for math course anxiety. These coefficients compared favorably with the .97 coefficient alpha reported by Richardson and Suinn (1972) for the full-scale 98-item MARS. Two-week test-retest reliability of the abbreviated scale, based on the subsample of 62 students, was .86. The authors also stated, because math test anxiety has been identified consistently as the major component of math anxiety in other studies that the 25-item abbreviated MARS would seem to be more appropriate for students because of its efficiency, economy, and administrative ease in measuring math anxiety. Thus, the MARS scale used had 25 items

measuring the level of anxiety in an individual. All items ranged from 5(very much) to 1 not at all).

Procedures

Upon institutional review board (IRB) approval, recruitment information was sent to three course instructors to distribute in their classes. Students were invited to participate in an online survey made up of three existing instruments: AGQ, MLSQ sections and Abbreviated MARS. Instructors were asked to send two reminders via their Blackboard site and email.

The researchers asked if students would be willing to participate in the online survey. Students were assured that there was no penalty for not participating, that completion of the survey had no relation to their course grade, and that they could withdraw at any time. The survey did not show any student identifiers other than gender. Also, students were assured that data would only be reported in the aggregate. The students were directed by their instructor to a link that took them to the online survey.

Data Analysis and Results

Multiple regression analysis was used to predict math anxiety from a set of predictors. Due to the fact that math anxiety is likely to be influenced by many factors, such as achievement goals and learning strategies, two multiple regression models were conducted to examine the question if math anxiety (The Abbreviated Version MARS) could be predicted from achievement goals (AGQ) and motivated strategies for learning (MSLQ). In the current study, Cronbach's alphas for MARS, MSLQ, AGQ and their subscales ranged from .5 to .9, respectively. Overall, the means for the independent variables were high (Table 1). Conversely, the math anxiety mean indicated that students' level of anxiety were not that high.

Table 1
Descriptive statistics for dependent and independent variables

Variables	Mean	SD	*n*
Achievement goal	5.19	.83	27
Performance approach	5.12	1.48	27
Mastery avoidance	3.35	1.84	27
Mastery approach	6.69	.57	27
Performance avoidance	5.59	1.14	27
Learning strategies	4.91	.29	43
Math anxiety	2.64	1.02	27

SD = standard deviation

The first multiple regression model was used to discern the amount of variance that could be predicted from achievement goals and motivated strategies for learning scores in terms of math

anxiety. The total model predicted a significant amount (43%) of the variation in math anxiety which was significant, R^2=.4, $F(2,26)$= 9.15, p<0.01. Achievement goal contributed significantly to the model (β =.58, p <.01). A second regression model included only each of the four achievement goals as separate predictors. Specifically, this model discerned the amount of variance that could be predicted from performance approach, mastery avoidance, mastery approach and performance avoidance goal orientations regarding math anxiety. The results of the regression model indicated that four of the predictors explained 55% of the variance in math anxiety, R^2=.5, $F(4,26)$ =6.73, p<0.01). A positive correlation between math anxiety and two of the predictors, mastery avoidance and performance avoidance were found significant, r=.73, r=.45, p <.01. Mastery avoidance statistically predicted math anxiety model (β =.73, p <.01). Simple correlations were also calculated between the achievement goals and students' reported use of self-regulated learning strategies, self-efficacy, and help-seeking behaviors. Mastery approach and self-efficacy were slightly correlated, r = .36, p < .05. Mastery approach and self-regulation were moderately correlated, r=.65, p<.01. Performance avoidance and self-efficacy were negatively correlated, r=-34, p<.05.

Discussion

While these analyses are the result of a pilot sample, and any conclusions should be considered with caution, preliminary findings are discussed in reference to our proposed objectives. Study limitations include a small sample size and the fact that not all respondents answered all items.

Our first research objective was to examine the feasibility of the proposed research design including recruitment strategies using an internet-based instrument and the validity and reliability of the instruments. We found that the recruitment strategies and research design were appropriate for this type of study. As the use of technology increases to support conducting research, benefits and challenges in using such a tool appear as well. While participants have the option to not respond to questions, it seems that electronic surveys may increase the nonresponse rate. The main sources of error in electronic surveys include "sampling, coverage, nonresponse, and measurement error" (Couper, 2000, p.466). The pilot sample was selected from the target population which was preservice teachers in South Florida; therefore we used a representative group of participants to avoid sampling error considering that was a nonrandom sample. The fact that only a small number of respondents were not willing to complete all survey items created minimum nonresponse bias (Couper, 2000). The fact that the sample was representative, the data collection was successfully completed online and internal reliability was medium to high, proved that the research design was appropriate, thus a main study could be carried out with a larger sample.

Our second research objective was to examine the nature of relationships between students' achievement goals, math anxiety, self-efficacy, self-regulated learning, and help-seeking behaviors. We found that the model including achievement goals and motivated strategies for learning (self-efficacy, self-regulated learning and help-seeking) predicted a significant amount of the variation in math anxiety. Results seem to indicate that the achievement goals students adopt do relate to their level of math anxiety and other achievement behaviors and outcomes. The patterns of these relationships were expected in light of the literature as both avoidant type goals correlated with math anxiety, while a mastery approach orientation seemed to relate to

more positive achievement behaviors including students' self-regulated learning and self-efficacy. These findings suggest that continued investigation to examine these relationships with larger samples is worthy of further study which is forthcoming.

Summary and Final Thoughts

There is a real need for creating more young people who have a passion and interest in STEM fields, people who are confident in their abilities and will set goals to pursue careers in the area of mathematics and the sciences. The first step in such an important educational goal is to understand effective ways to reduce math anxiety and encourage more positive attitudes for learning mathematical concepts. If the goals students adopt have some relationship to beneficial achievement behaviors and a healthy outlook for learning math concepts, we can then consider how the research literature outlining suggestions for creating mastery-oriented classrooms may also help to reduce the anxiety students experience during mathematics instruction (Furner & Gonzalez-DeHass, 2011).

In particular, research in this area should continue to examine pre-service teachers' achievement goals and how they relate to their mathematics learning. The teacher's classroom behaviors, both overt and covert, during math instruction have proven to be influential on students' math anxiety (Jackson & Leffingwell, 1999). A teacher's achievement goals can impact students' learning goals, self-efficacy, use of positive coping strategies, and willingness to seek help and ask questions (Butler & Shibaz, 2008; Friedel, Cortina, Turner, & Midgely, 2007). What makes this study unique is that few published studies have actually examined the relationship between math anxiety and all four achievement goal constructs previously, and we did not locate any studies that examined pre-service teachers' goals and their relationship to math anxiety specifically.

Math anxiety is a very real thing affecting our future classroom teachers and their students. This study suggests that the achievement goals students adopt do relate to their level of math anxiety and other achievement behaviors and outcomes. The patterns of these relationships were expected in light of the research literature since both avoidant type goals correlated with math anxiety, while a mastery approach orientation seemed to relate to more positive achievement behaviors. It is critical in today's high tech STEM oriented society to encourage all young people, especially future classroom teachers, to take more mathematics and STEM related classes and perhaps come to terms with such anxiety before starting their career as a teacher. In this way, hopefully they will be able to better promote STEM-related fields with future students they may be working with. It is critical that we have both teachers and students on board having positive dispositions toward mathematics which then can promote more young people going into careers in the various STEM fields.

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