

# Chapter 67

## Using the Flipped Classroom Instructional Approach to Foster a Mathematics–Anxious–Friendly Learning Environment

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### ABSTRACT

*This chapter examines the nature and characteristics of mathematics anxiety learning and provides instructional implications for highly mathematics-anxious learners, which are informed by lived experience. The discussion comes from research on the Mathematics Anxiety Learning Phenomenon (MALP), a hermeneutic phenomenological study using Wilber’s Integral Model as the underpinning framework. Based on the lived experience data, hermeneutic themes were developed, and it is shown that those themes are capitalized upon in the flipped approach to foster a mathematics-anxious-friendly learning environment. Using the themes from the study, the chapter argues that the flipped approach could be beneficial to students who are highly mathematics-anxious. The system of linear equations with two variables, a common mathematics topic, is used to illustrate how the flipped approach to instructional design could recognize mathematics-anxious adult learners.*

### INTRODUCTION

“Mathematics anxiety” is a term that has been tossed around by students and teachers alike since the 1950’s. While it is undisputable that many students suffer from mathematics anxiety, its nature remains largely unknown to mathematics teachers. Furthermore, the current established remedies largely address mathematics anxiety as an individual manifest, with only temporary

relief for students and without accounting for the social learning environment. This is a reflection of an unclear understanding of this widespread phenomenon, resulting in students developing unpleasant feelings and distaste toward the subject of mathematics as a whole.

The aim of this book chapter is to examine the nature and characteristics of mathematics anxiety learning, and to provide instructional implications for highly-mathematics-anxious learners which

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are informed by lived experience. Through the flipped classroom instructional approach, one could implement these implications that are often overlooked with the traditional approach. The discussion of mathematics anxiety is from the author's dissertation research on the Mathematics Anxiety Learning Phenomenon (MALP), a hermeneutic phenomenological study using Wilber's Integral Model as the underpinning framework. Through the lived experience data, hermeneutic themes were developed, which can be capitalized upon using the flipped classroom approach to foster a mathematics-anxious-friendly learning environment. Through the examination of these themes and the instructional implications, one can argue that the flipped approach could be beneficial to students who are highly mathematics-anxious. This book chapter will be organized in the following manner:

1. Past research on mathematics anxiety,
2. The hermeneutic phenomenological study on mathematics anxiety: its methods, data, results, and the interpretation of the lived experience,
3. The implications for mathematics-anxious friendly instruction and how the flipped classroom approach has great potential to foster a more positive learning environment, and
4. The chapter will conclude with an instructional example on solving systems of linear equations of two variables, using the flipped classroom instructional approach to demonstrate how an improved learning environment could be mathematics-anxious friendly.

## **BACKGROUND**

### **Definition of Mathematics Anxiety**

Richardson and Suinn (1972) pioneered a widely cited definition for mathematics anxiety as the

“feelings of tension and anxiety that interfere with the manipulations of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations” (p.551). Mitchell (1984) characterized mathematics anxiety as a “behavior which has been learned on a sub-conscious, automatic, reflective level by pairing previous experiences which were painful with the activity of mathematics” (p. 37). Both definitions were grounded in psychology, and they described it as an individualistic phenomenon. However, it seemed that there ought to be a social aspect to mathematics anxiety. Consider the following vignette to illustrate how social interaction may affect a learner's outlook:

*Years ago, I was a faculty member who advised a group of students who were enrolled in a bachelor of business administration program who were required to take a statistics course. I overheard their conversations when they were selecting from the different courses offered in a semester. Some of the comments were, “Professor [Deleted] is really tough, and he doesn't answer any questions that you ask,” “His assignments are just impossible,” and “The course goes way over what I need to know.” What surprised me was that the students had started an informal support group to vent their negativity before the course had even begun. When I confronted them about what I had heard, they had no inhibitions telling me how negative they felt toward the course and toward that professor. Fast forward to the end of the semester when the final examinations were fast approaching, the same group of students talking to each other, “I don't care how to do this, but as long as I can pull off a C minus, I'll be happy,” “I am ready to burn the lecture notes the minute the final exam is over,” and “I will never take Professor [Deleted]'s course ever again.”*

This episode was a conflicted and challenging moment both for me as a fellow mathematics professor and for these students. On one hand, I

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