

Improving Student Performance by Reducing Anxiety

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The Practice

Anxious students and complex subject matter combine to create a difficult environment in which to teach successfully. Statistics is certainly one of the subjects that is challenging in this way, both for students and for instructors. Especially difficult are the introductory statistics courses that are mandatory in many disciplines. Few students look forward to these courses and many students approach them with dread. To be effective in such a situation an instructor needs to recognize the problems created by anxiety and to develop creative ways to address them. In my role as a statistics instructor I have identified four related problems and created a specific teaching method to solve these problems, a method which has been facilitated by the use of electronic technology.

Four Problems Associated With Student Anxiety

1. **Anxiety blocks the normal thought processes.** Anxiety and panic seriously interfere with memory, attention, and concentration and are emotionally draining. Energy is deflected from, rather than concentrated onto, attending to discussions and instruction. Such blocks can lead to poor understanding, poor results and a loss of self-confidence.
2. **Anxiety favours a passive approach to material rather than interaction with it.** Anxious students prefer to wait for the material to be fed to them, rather than to actively engage it or attempt to use it.
3. **Anxiety is associated with a general sense of incompetence.** The favoured passive approach seems to result from disbelief that a more active approach would be of any value. Students lacking confidence fail to engage actively with the material, thus fail to internalize concepts and then do poorly on assignments, thereby reinforcing the feeling of incompetence at the core of the cycle. The insecurity builds upon itself leading the student eventually to give up.
4. **The anxious student has little inspiration for learning the material.** Students are forced to come to class because it is a required course, but in the face of the problems listed here the result is either a complete lack of interest in learning the material or, at best, a desire only to learn the bare minimum to pass the course.

How Can Instructors Help? Practices that Address Student Anxiety:

My teaching approach is based on active learning principles and is designed to create a dynamic and effective learning environment where students' subject-specific (math/statistics in this case) anxiety is reduced. Electronic technology has proved very helpful in creating and maintaining this environment.

1. **Help students focus on the material, rather than on their anxiety.** Rather than attend to the meaning of the various aspects of the class as it proceeds, students at a high level of anxiety become obsessed with writing down everything that I say. To reduce anxiety about missing important points I provide lecture notes for all of the statistical topics considered in the course. I structure each class around one set of such notes and display them on an overhead projector so that I can easily direct students' attention to key points and transitions, which they can highlight on their copies.

I find that anxiety is reduced when students are clear about the purpose of each class and the elements within it. Thus, my notes itemize [learning objectives](#) as well as the flow of the

theoretical and factual information. Within the notes I provide a [graphical overview](#) of how each section fits with what has gone before and what is to come as the class proceeds. The notes also include [problem-solving exercises](#) to be completed during the lectures and have space for students to add solutions on their copies as they are discussed.

Simultaneously in each class, but separately from the overhead notes, I use [PowerPoint presentations](#) to illustrate specific statistical concepts and provide solutions of examples. I also use visual props to illustrate difficult statistical concepts and to aid students in gaining a better conceptual understanding of them. These types of presentation readily capture students' attention and, if well designed, can engage them in learning the subject. As a result of the combination of notes, PowerPoint illustrations and visual props, students spend most of the class time listening to my explanations of the concepts and reflecting on what is being taught.

- 2. Help students overcome the passive approach to the subject.** If I succeed in attracting the attention of the anxious student toward the material, a second goal is to encourage active interaction with that material. My practice includes two general strategies, [simulations of statistical concepts](#) and group interaction with respect to the concepts. The simulation capability of easily-created [Java applets](#) (web-based interactive simulations/demonstrations) enables hands-on practice outside class time and self assessment by students of their understanding, as well as visual reinforcement of the concepts. The frequent formation in class of [discussion groups](#) for problem-solving and responding to open-ended questions, encourages students to move beyond listening towards actively asking questions and participating in critical thinking. I also create group [project assignments](#) based on real-life research examples as an inducement to engagement with the statistical concepts.
- 3. Help anxious students reduce their sense of incompetence.** Frequent success is the best way to begin building a sense of competence. If students succeed in following what is going on in class and in participating in the class, then they are going to begin believing that competence is possible. I emphasize to my students that mistakes are an inevitable part of learning, and therefore I give them opportunities to correct their mistakes so that they gain confidence in their ability to do so. I also choose [evaluation methods](#) that provide frequent feedback because success is more likely on small units. Frequent evaluation on small units also allows misunderstandings to be addressed prior to evaluation on larger units.
- 4. Be a source of inspiration for students to learn the subject.** I am not afraid to allow my passion and enthusiasm for statistics and for teaching statistics to show in the classroom. I find that the students are inspired by it to draw upon all their energy and talents. [Harry Murray](#) (1997) of the University of Western Ontario has observed that instructor enthusiasm is associated with both course success and motivation for further study. I also empathize openly with students who are learning the material for the first time by putting myself in their place and acknowledging their struggles. Such empathy helps me remember to listen carefully, to encourage their questions and to respond to them enthusiastically. I attempt to establish a solid student-teacher relationship by keeping in mind the dictum “nobody cares what you know until they know that you care.”

Guiding Principles Behind the Practice

I am guided by the principle that every student is capable of learning math and statistics if they can be helped to overcome the obstacles that stand in the way. For many students, anxiety is the primary obstacle. I work on the principle that the instructor can help overcome anxiety through being clear, through setting tasks that encourage active engagement with the material, through creating situations that allow students to make and correct mistakes without undue penalty, and through displaying one's enthusiasm for the enterprise openly.

Additionally my practice has been influenced by the principle that students vary in learning style. This principle has led me to seek a wide variety of means of presenting the course material, rather than relying solely on the standard “chalk and talk” which many students find discouraging for its dryness and

formality. Electronic technology has made it possible for me to utilize several of these methods simultaneously.

Sources of Inspiration or Influence for the Practice

Teaching has always been one of my passions. I take great pleasure from working to find a means to teach challenging material in an understandable, meaningful way; and there is a great reward in seeing students overcome their anxieties and gain that understanding. What a joy to see students' confidence increase as they learn and apply something they were scared of before coming to my class. I am inspired to continue improving my presentation methods every time I see my students progressing in these ways.

Frequently Asked Questions About the Practice and Responses

1. Isn't walking into a class with handouts, overheads, PowerPoint presentations and computer demos as likely to intimidate anxious students as it is to calm them?

No, not if the instructor uses the resources smoothly. The instructor needs to be familiar with the technologies available in the classroom (such as data projectors, computer connections, and overhead projectors). During the lecture, the instructor needs to have the overheads organized, know which PowerPoint slides will come into play and in what order with respect to the lecture notes. The instructor will also have to plan when demonstrations (visual props, Java applets) will be used. When the information is presented in a well-organized manner, different learning styles can be addressed, learning can be enhanced, and anxiety can be reduced.

2. If you give so much attention to the problems of anxiety, how do you avoid discouraging the students who are eager and don't have this problem?

Actively engaging students in the learning process and using different technologies encourages both anxious and eager students. The instructor does not need to concentrate on writing material on the board, and students do not need to write everything that the instructor says. There are many opportunities in the class for eager students to think critically and ask challenging questions. In group discussions and during the group projects, eager students can work with the anxious students, creating a win-win learning environment.

3. How does one create Java applets? Are they difficult to use?

A Java applet is a program that runs from inside a World Wide Web browser such as Microsoft Internet Explorer or Netscape Communicator. Java applets are created using Java, an object-oriented programming language developed by Sun Microsystems. To create these applets, a person needs to learn the Java programming language. There are numerous books and web sites available demonstrating how to create Java applets. the [Trail Map: Your Guide to Java Tutorial](#) web site provides constructive tutorials.

Java applets are very easy for both students and instructors to use. Because the applets run through a World Wide Web browser, students and instructors can easily use the existing software in their computer to run the applets. The applets can be very user friendly. How easy they are to use depends on how they are designed, so it is worth spending extra time to design them well.

For More Information (Reference and Links)

Murray, H. G. (1997). Effective teaching behaviors in the college classroom. In R. P. Perry & J. C. Smart (Eds.) [Effective teaching in higher education: Research and practice](#) (pp. 171-204). New York: Agathon Press.

View the [course website](#). Read [student evaluations of the course](#) arranged according to my four suggestions for addressing anxiety.

Sheila Tobias is probably the best-known author on math anxiety. Among her books are *Overcoming Math Anxiety* and *Succeed with Math*. [View her website](#) which describes these books and gives other information relevant to math anxiety.

An interesting website for students that deals with both [math anxiety and learning styles](#).

[Other resources](#) on these topics.

Math anxiety is not the only obstacle that statistics students face, of course. Joan Rosebush, who teaches math at the University of Vermont, [lists some others](#).

For further examples of using electronic technology to suit presentations to different learning styles see Susan Montgomery's "[Addressing Diverse Learning Styles Through the Use of Multimedia](#)."

Most colleges and universities have a centre devoted to instructional development. These centers typically offer assistance to faculty members who wish to use electronic technology in their classrooms. [List of centres](#) at Canadian universities.

For more ideas about inspiring teaching see the following sources:

Fallows, S. (1999). [Inspiring Students: Case studies on teaching required courses](#). London: Kogan Page.

Roth, J.K, (Ed.). (1997). [Inspiring Teaching: Carnegie Professors of the Year Speak](#). Bolton: Anker.