What Is Attrition?
Attrition is the number of students enrolled in a program compared to the number of students who complete it. A recent polling of student from 1667 American universities asked why students dropped out of their STEM program (1) (Figure 1). From this, it becomes apparent that there are two general reasons why students leave a STEM program:

1. The classroom environment
2. The personal situation of the student

The causes of attrition rates in STEM programs that are inherent to the program, such as required skills or subject difficulty, are far less influential on student attrition than the culture surrounding the program. The rising attrition rates in STEM programs contributes to several larger issues in society, including a decline in the number of STEM graduates, and a unfulfilled demand for STEM workers and the innovations they bring.

Science Attrition Rates

Studies done by the U.S. Department of Education shows some surprising trends in student attrition and other factors. Figure 2 shows the attrition rates of students based on their backgrounds, including ethnicity, income, and math background in high school. Surprisingly the statistical change in attrition based on a student’s background is not as large as one might expect when compared to the high rates of average students.

The attrition rate for STEM majors are extremely high for fields that are in demand. 48.3% of students in a STEM program will leave a bachelor’s degree program, and 69.3% will leave from an associate’s degree program. These statistics show that there is some issue within STEM programs.

Possible Solutions
In order to remedy this chilly climate instructors need to create a feeling of cooperation in the classroom, and encourage students to work together to solve problems in large lecture halls. Ideally science classrooms would be smaller, but often this is not feasible in large universities. Even so, the research suggests that large classes aren’t so much to blame as the lecture format of the course.

Studies show that students who have open relationships with faculty members in an active learning environment are more likely to remain in their major. Some studies show that failure rates decrease as much as 10% in an interactive course, showcasing the importance of mentoring in a science major. Improvement of advising and mentoring will lower attrition rates, as many students who leave a STEM major trace their choice back to poor faculty advising.

Causes
The Chilly Climate Hypothesis:
Many Education Scientist, such as Daempfle, cite the most common reason for leaving a STEM major as “the chilly climate” of science classrooms. Students feel that the science classroom is one of competitiveness, and the one-way lecture setting combined with the sarcastic nature of many instructors only serves to foster this feeling among students. Research has shown that this feeling persists even among students who remain in the major, suggesting that it is not dependent on the cognitive ability of the student.

Connect with Faculty:
Perceived faculty indifference toward students and preoccupation with research is another common reason for leaving STEM fields. As a result, students oftentimes do not develop support networks with faculty. Poor faculty advising is also a problem among STEM fields, and many students do not understand the time or financial commitment involved with studying science.

Classroom Structure:
In contrast to many non-STEM majors, science classrooms are often dominated by a lecture style of teaching, especially at large universities. Traditionally, large class sizes and language barriers with foreign teaching assistants have been blamed for high STEM attrition rates, but many do not find this to be the case. Rather, the boring lecture format combined with the so-called “chilly climate” and general “lack of nurture” for students seems to be at fault.

References

