9 Strategies for Motivating Students in Mathematics

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Student Engagement

Keep your high school math students engaged with these techniques.

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Motivating students to be enthusiastically receptive is one of the most important aspects of mathematics instruction and a critical aspect of any curriculum. Effective teachers focus attention on the less interested students as well as the motivated ones. Here are nine techniques—based on intrinsic and extrinsic motivation—that can be used to motivate secondary school students in mathematics.

Extrinsic and Intrinsic Motivation

Extrinsic motivation involves rewards that occur outside the learner's control. These may include token economic rewards for good performance, peer acceptance of good performance, avoidance of "punishment" by performing well, praise for good work, and so on.

However, many students demonstrate intrinsic motivation in their desire to understand a topic or concept (task-related), to outperform others (ego-related), or to impress others (social-related). The last goal straddles the fence between intrinsic and extrinsic.

With these basic concepts in mind, there are specific techniques that might be expanded, embellished, and adapted to the teacher's personality and, above all, made appropriate for the learner's level of ability and environment. The strategies are the important parts to remember—examples are provided merely to help understand the techniques.

Strategies for Increasing Student Motivation in Math

1. Call attention to a void in students' knowledge: Revealing to students a gap in their understanding capitalizes on their desire to learn more. For instance, you may present a few simple exercises involving familiar situations, followed by exercises involving unfamiliar situations on the same topic. The more dramatically you reveal the gap in understanding, the more effective the motivation.

2. Show a sequential achievement: Closely related to the preceding technique is having students appreciate a logical sequence of concepts. This differs from the previous method in that it depends on students' desire to increase, not complete, their knowledge. One example of a sequential process is how special quadrilaterals lead from one to another, from the point of view of their properties.

3. Discover a pattern: Setting up a contrived situation that leads students to discover a pattern can often be quite motivating, as they take pleasure in finding and then owning an idea. An example could be adding the numbers from 1 to 100. Rather than adding the numbers in sequence, students add the first and last (1 + 100 = 101), and then the second and next-to-last (2 + 99 = 101), and so on. Then all they have to do to get the required sum is solve 50 × 101 = 5,050. The exercise will give students an enlightening experience with a truly lasting effect. There are patterns that can be motivating, especially if they are discovered by the student—of course, being guided by the teacher.

4. Present a challenge: When students are challenged intellectually, they react with enthusiasm. Great care must be taken in selecting the challenge. The problem (if that is the type of challenge) must definitely lead into the lesson and be within reach of the students' abilities. Care should be taken so that the challenge does not detract from the lesson but in fact leads to it.

5. Entice the class with a "gee whiz" mathematical result: There are many examples in the mathematics realm that are often counterintuitive. These ideas by their very nature can be motivating. For example, to motivate basic belief in probability, a very effective motivation is a class discussion of the famous birthday problem, which gives the unexpectedly high probability of birthday matches in relatively small groups. Its amazing—even unbelievable—result will leave the class in awe.

6. Indicate the usefulness of a topic: Introduce a practical application of genuine interest to the class at the beginning of a lesson. For example, in high school geometry, a student could be asked to find the diameter of a plate where all the information he or she has is a section of the plate that is smaller than a semicircle. The applications chosen should be brief and uncomplicated to motivate the lesson rather than detract from it.

7. Use recreational mathematics: Recreational motivation involves puzzles, games, paradoxes, or the school building or other nearby structures. In addition to being selected for their specific motivational gain, these devices must be brief and simple. An effective execution of this technique will allow students to complete the recreation without much effort. Once again, the fun that these recreational examples generate should be carefully handled, so as not to detract from the ensuing lesson.

8. Tell a pertinent story: A story of a historical event (for example, the story of how Carl Friedrich Gauss added the numbers from 1 to 100 within one minute when he was a 10-year-old in 1787) or a contrived situation can motivate

students. Teachers should not rush while telling the story—a hurried presentation minimizes the potential motivation of the strategy.

9. Get students actively involved in justifying mathematical curiosities: One of the more effective techniques for motivating students is to ask them to justify one of many pertinent mathematical curiosities, like the fact that when the sum of the digits of a number is divisible by 9, the original number is also divisible by 9. The students should be familiar and comfortable with the mathematical curiosity before you challenge them to defend it.

Teachers of mathematics must understand the basic motives already present in their learners. The teacher can then play on these motivations to maximize engagement and enhance the effectiveness of the teaching process. Exploiting student motivations and affinities can lead to the development of artificial mathematical problems and situations. But if such methods generate genuine interest in a topic, the techniques are eminently fair and desirable.

You can find more examples of how to use these strategies in my book with Stephen Krulik, *Effective Techniques to Motivate Mathematics Instruction*.

About the Author

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