

Research Brief

Motivating Struggling Math Students

Question: What does the research say about motivating struggling math students?

In a Nutshell

Success in today's workplace "...demands that individuals understand multidimensional problems, design solutions, plan their own tasks, evaluate results, and work cooperatively with others" (Lachat, p.10). When students learn to think beyond the easy answer, they become curious, ask questions, and experience success, all of which leads to higher levels of thinking, problem solving and concept retention.

The National Council of Teachers of Mathematics recommends mathematics programs that are engaging, and anchored in real world application. They have identified many instructional strategies that both engages and motivate reluctant mathematics students.

Summary of Findings:

According to the National Council of Teachers of Mathematics (NCTM) "...those who understand and can do mathematics will have opportunities that others do not. Mathematical competence opens doors to productive futures. A lack of mathematical competence closes those doors" (www.nctm.org). For many students who are unsuccessful in math there is a great feat that they do not and never will "get it," or that because other family members were not good at math, their poor math skills are genetic.

The NCTM recommends that math programs be based on developing and using reasoning and "sense making" skills. Reasoning is defined as beginning with ideas, proofs, etc., and, drawing conclusions about those ideas and proofs, based on evidence and/or assumptions. Sense making means that students understand math in context and are able to make connections between new learning and prior knowledge (<http://www.nctm.org/about/default.aspx?id=166>).

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If students are mathophobic, what are some things that educators can do to motivate and help these students become more successful at mathematics Davis, 1999?

Motivational Strategies

The literature suggests the following instructional practices are useful in motivating reluctant math students.

- Offer frequent and positive feedback on what students are doing well
- Reinforce the things at which students are succeeding
- Listen to, value and respect students and their ideas
- Provide specific feedback that will help the student take the next logical steps
- Assign tasks that students can do that are not too easy nor too challenging
- Gradually increase the difficulty of assignments throughout the term
- Help students find relevance in the concept
- Provide a safe environment where taking risks is the norm
- Use varied pedagogy
- Emphasize mastery
- Do not create high stakes competition among peers
- Be enthusiastic
- Inform students about what success looks like in mathematics and how you will help them achieve it
- Challenge students cognitively and emotionally

Sources: Davis (1999); Math Worksheet Center; Matthews (2008); McCall (n.d); On the cutting edge-Professional Development for Geoscience Faculty (n.d.); Sasson (2007);

Some suggested strategies

The literature also suggests the following strategies for building a culture supportive of math achievement.

- Review the curriculum and determine how much is being asked of the students. Does it require mostly rote memorization? Does it provide opportunities to use math in real life situations? Revise as appropriate.
- Ask students about things that motivate them.
- Ascertain the students' interests, hobbies, goals, dreams, etc. and how those relate to math.
- Establish work based on the students' interests, their prior knowledge, etc.
- Make the work relate to real life. When in real life is/could the situation be found? How does it directly relate to them?
- If possible, allow the students to help establish the curriculum or at least part of it.
- Ask questions and allow problems to become experiments. "Don't tell students something when you can ask them."
- Use more project-based problems.
 - Phase 1- discuss the topic and the students' experiences with it
 - Phase 2- students do research, fieldwork, data gathering, etc.
 - Phase 3- students present to an audience (Curtis, 2001).

- Give students high preference tasks first so they will feel more comfortable and experience success before giving them more low preference work. Perhaps offer them an array of different problems and let them select what they would like to do first before moving on to other, more difficult problems.
- Effectively integrate and utilize technology (i.e. iPods, cell phones, computers, YouTube, etc.) in the curriculum. This will help students gain the requisite skills for the marketplace and support more active engagement in their own learning.
- Use cooperative learning groups and allow students to work together when appropriate. Many students will do better in a more collaborative environment.
- Incorporate hands-on activities as appropriate.
- Play games that reinforce concepts.
- Brainstorm potential problems, issues, etc. and possible solutions.
- Ask for more than one solution to a problem.
- Play “devil’s advocate” to solicit different perspectives from the students.
- Routinely use warm ups that will hook students into the concept of the day.
- In solving problems, have the students talk it through, then work with them step-by-step from where they get stuck.

Sources: Banda (2009); Center for Teaching (2009); Curtis (2001); Davis (1999); Lynne (2007); Math worksheet center (n.d.); McCall (n.d.); Wagaman (2009).

Resources

- Banda, D. (2009). Motivating math students with high preference strategy. Retrieved online <http://www.ernweb.com/public/1132.cfm>
A method for getting students to complete preferred math tasks before moving to unpreferred is described.
- Center for teaching. (2009). Lessons to motivate underachieving math students.. Retrieved online <http://mste.illinois.edu/mccall/mainlesson.html>
This site has many active links to available software, lesson plans and games to help motivate students in math.
- Curtis, D. (2001). Real world issues motivate students. Retrieved online <http://www.edutopia.org/start-pyramid>
A description of project-based learning and its benefits is provided in this article.
- Davis, B. G. (1999). Motivating students. Retrieved online <http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/motiv.htm>
This piece lists things to do to motivate and challenge students in the classroom.

- Lachat, M. A. (2001). Breaking Ranks. Retrieved online
http://www.alliance.brown.edu/pubs/hischlrfm/datdrv_hsrfm.pdf
“This was written for all district and school administrators, teachers, staff developers, and public school advocates seeking greater understanding of how to create school cultures that continuously use data to improve student learning and achievement. The process of creating learning environments that support the individual success of each student must incorporate both the willingness and the capacity to continually examine the results of our efforts. This principle of continuous improvement requires the best data available. “
- Lynne, B. (2007). Motivating math students. Retrieved online
http://teachingtechnology.suite101.com/article.cfm/motivating_math_students
This is a brief article that provides a few suggestions for motivating students in math.
- Math worksheet center. (n.d.). 10 ways to motivate high school students to value math. Retrieved online
<http://www.mathworksheetscenter.com/mathtips/motivatehighschool.html>
A succinct list of ten ideas for motivating students in math is given in this piece.
- Matthews, J. (2008). Five ways to motivate students. Retrieved online
<http://www.washingtonpost.com/wp-dyn/content/article/2008/08/04/AR2008080400432.html>
This is a book review by Goslin entitled: Engaging Minds: Motivation and learning in America’s schools. Five main points for motivating students are presented in the review.
- McCall, A. (n.d.). Motivational strategies for underachieving math students. Retrieved online <http://mste.illinois.edu/mccall/summary.html>
This article describes several different successful high school math programs as well as the importance of the utilization of technology and implementation of different strategies.
- National Council of Teachers of Mathematics. (n.d.). Retrieved online
<http://www.nctm.org/about/default.aspx?id=166>
This is the home page for NCTM. The standards, goals and expectations can be selected and downloaded from this site.
- On the cutting edge-Professional development for geoscience faculty. (n.d.)
Motivating students. Retrieved online
<http://serc.carleton.edu/NAGTWorkshops/affective/motivation.html>
Although written for a college course, this article provides many motivational ideas for teachers. An active link to other salient articles is included.

- Sasson, D. (2007). Motivating high school students. Retrieved online http://lesson-plan-help.suite101.com/article.cfm/motivating_high_school_students
This is a very brief piece with a few ideas for motivating student.
- Wagaman, J. (2009). How to create motivating math activities. Retrieved online http://lesson-plan-help.suite101.com/article.cfm/how_to_create_motivating_math_activities
A brief article that provides a few motivating ideas in math is given here.

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