Improving Student Collaboration, Engagement, Motivation and Learning

Presenter: Paul Nolting

Wednesday, March 17, 2021
3 pm Eastern
Improving Student Collaboration, Engagement, Motivation and Learning

3 -17- 2021
3:00 to 4:00

Presenter
Dr. Paul Nolting
Learning Specialist
p.nolting.phd@gmail.com

Presider
Dr. Julie Phelps
AMATYC IMPACT
jphelps@valenciacollege.edu
Workshop Agenda

- Research on variables that affect motivation and learning
- Collaboration between faculty and student
  - Strategies for collaboration
  - Responsibility is on both faculty and student
- Student engagement
  - Math Self Efficacy
  - Anxiety reduction
- Motivation
  - Internal, external and giving hope
  - Math Study Skills Evaluation
- Learning
  - Online homework note-taking system
  - Virtual tutor interactions
Variables Contributing to Student Academic Achievement (Bloom, 1976; Zientek, 2013)

Students have control to improve their affective characteristics, learning and math/STEM grades. Select several affective and learning characteristics to improve:

- Cognitive Entry Level Skill + IQ
  
  Pre-requisite Skills/Learning

- Quality of Instruction <25%

- Affective 25% - Characteristic 41%
  - Math Self-efficacy
  - Locus of Control
  - Study Skills
  - Anxiety/PTS
  - Motivation
  - Mindset
  - Mindfulness

- Aptitude
  - Learning speed
  - Ability to learn math concepts and generalize
  - Fluid reasoning
  - Working memory
  - Long-term memory

- Collaboration
- Engagement
- Self-efficacy
- Co-requisite design
- Tutor/LRC training
- Virtual/online learning models
- Math/general study skills – classroom, tutor center, LRC and online
- Persistence
- My Success Plan
Maximize Students’ Affective Characteristics

• Sources of Self-efficacy of Community College Students Enrolled in Developmental Mathematics (Zientek, Fong & Phelps, 2017) - Four sources explain 35.8% of variance

• Student Success in Developmental Mathematics Courses (Zientek, L.R. 2013)–Affective Characteristics – 41%

• Math anxiety: who has it, why it develops, and how to guard against it (Maloney & Beilock, 2012) – Need to address anxiety and affective – More math practice does not reduce anxiety

• A Review of the Literature on Online Developmental Mathematics: Research –Based Recommendations (Coleman, S.L. et al, 2017) – Recommends structured design, frequent communication, instruction on self-directed learning, support services (tutoring), faculty development and others.
Collaboration Between Faculty and Student

- Student and faculty work together – Team approach
- Responsibility is on the student and faculty to work together
- Areas of responsibility
- Faculty can teach self-directed learning behaviors and skills
- Student and faculty ownership [Chapter Four of the IMPACT document.](#)
Team Approach and Responsibility

• Ask students what they need
  During first part of class sessions
  Through a survey
  Discuss results with class

• Ask student how can we work better together?

• Sometimes they don’t care until you show that your care. How do you show you care?

• What are the learning areas of responsibility?
Variables Contributing to Student Academic Achievement (Bloom, 1976; Zientek, 2013)

Students have control to improve their affective characteristics, learning and math/STEM grades. Select several affective and learning characteristics to improve:

- Placement
- Grades
- Math history
- Pre-requisite skills
- Collaboration
- Engagement
- Self-efficacy
- Co-requisite design
- Tutor/LRC training
- Virtual/online learning models

- Cognitive Entry Level Skill + IQ (Pre-requisite Skills/Learning) - 34% - 50%?
- Quality of Instruction - <25%
- Affective - 25% - Characteristic - 41%
  - Math Self-efficacy
  - Locus of Control
  - Study Skills
  - Anxiety/PTS
  - Motivation
  - Mindset
  - Mindfulness

- Aptitude
- Learning speed
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- Math/general study skills – classroom, tutor center, LRC and online
- Persistence
- My Success Plan
Ownership & Self-directed Learning

• Student and faculty ownership to [Chapter Four of the IMPACT document](#)

Components: Discovery, responsibility & continue learning to improve learning

Offer workshops based perceived and on student needs Virtual office hours on different topics

• Most important is self-assessment

Need more formative assessment: [Review: Summative vs Formative article](#)

Need to know how they are doing before taking the test or failing

Judging current grade/learning skills: Quizzes, homework checks, notes check, time management, short term goals, grade log – Turn in to you
Ownership & Self–directed Learning

Faculty need to teach self-directed learning behaviors and skills – Need to be a coach

- Need to coach them up on these skills
- Asking questions – Praise them
- Self- regulated learning
- Motivation
- Time management
- Math self-efficacy - Next

Self-Directed Learning Through Student and Faculty Ownership - Paul Nolting
Chapter Five IMPACT
  Chapter Five of the IMPACT document

Math Self-Efficacy

Anxiety Reduction

Six Types of Test-taking Errors

Individual Faculty Engagement

IMPACT Plus - Strategies for Student Engagement – Paul Nolting posted 1-11-21
Bandura postulated that addressing self-efficacy would alleviate math anxiety

- Four sources of self-efficacy (Bandura, 1997)
  - (a) **enactive mastery experiences** - Learning occurs through actual successful performances – Most successful
  - (b) **vicarious experiences** - Learning from models (students) raises SE as learners vicariously judge their own competencies through the success of others.
Self-Efficacy

(c) **verbal persuasion** - Feedback should be realistic and authentic; exert greater effort and try harder to succeed – Send emails

(d) **physiological and affective states** - Mathematics anxiety; One’s physical status, stress levels, emotional proclivities, and interpretations of bodily states can alter SE
Instructors Recommendations from Zientek, Fong, & Phelps, 2017-

Instructors should

– Focus on students’ successes instead of what they do not know - Catch them doing problems correct – Praise them

– Discuss with students how self-efficacy impacts mathematics achievement

  • Cultivate new virtual mastery experiences
  • Create learning communities with similar shared life experiences – ZOOM rooms
  • Provide constructive, timely, and specific feedback for errors which encourages students
  • Limit time pressures, competition and anxiety

Zientek, Fong and Phelps (2017)
Student Self-Efficacy Strategies

• Mastery Experiences – Improving performance
  Improving math study and test-taking skills

• Vicarious Experiences – Observing models
  Group discussions on student successful used of math study and test-taking skills
  Instructors tell stories of similar successes

• Social Persuasions – Positive Feedback from Outside Source
  Mindset (F or G), mindfulness, instructor, tutor, advisor, counselor - Student Math Success Plan
Student Self-Efficacy Strategies

Physiological States

Assessing Math Study Skills Evaluation and, Test Anxiety, Learning Styles

Attribution Theory

Setting and Achieving Short-term Goals

Managing Anxiety & Reducing Test Anxiety

Mindsets – Fixed and Growth

The power of saying, “Not yet”

I can’t do math
I can’t do chemistry
I can’t do physics
I can’t do biology
Mindfulness Strategies

- Mindfulness – Ability to interact with the present moment without allowing past or future thought and feeling interfering
  - Past experiences could cause depression
  - Future experiences could cause anxiety
- Stay in the present moment – What can I do now to improve math success: test anxiety reduction, complete homework, tutoring, review notes, positive self-statements, exercise, others
Six Types of Test-taking Errors

1. Misread Directions
2. Careless Errors
3. Concept Errors
4. Application Errors
5. Test Procedure Errors
6. Study Errors

Teach Final Exam Preparation

Use the eraser wisely. Sometimes it is better to scratch something out at first and then make sure the correction is right. Go back and erase, leaving the correct information. Sometimes when we are nervous, we may change a correct right answer.

Six Types of Test Taking Errors
Managing Test Anxiety: Causes & Solutions

- Association of grades with worth.
- Poor general or math study skills.
- Previous embarrassment from teacher, students, family (third grade).
- Learning preference not match virtual redesign.
- Instructor Solutions – Relaxation techniques, positive cognitive statements, acceptance & math study skills
Teaching Relaxation Techniques

- Tensing and relaxing
- Deep breathing
- Visual imagery (daydreaming)
- Positive self talk
- Discuss with class
- Discuss anxiety from your experience
- Show a short video in class
Test Anxiety: Myths – Ask Students

• Students are born with it.
• Test anxiety is a mental illness.
• Test anxiety cannot be reduced.
• Any level of test anxiety is bad.
• All students who are not prepared have test anxiety.
• Students with test anxiety can’t learn math.
• Students who are well prepared don’t have it.

• Very Intelligent students who are in calculus don’t have it.
• Attending class and doing homework should reduce all of it.
• Being told to relax will make you relaxed.
• Doing nothing about it will make it go away.
• Reducing test anxiety guarantees better grades.

Make into a quiz and send to students – Discuss in class.
Tensing and Relaxing Technique

Relax all your muscles.

Tense your muscles. Pull up with your arms tight. Press down with your feet and legs. Hold for a few seconds.

Relax. Repeat one more time if necessary.
Calm Yourself Right before the Test

- When you first get into the classroom and you want to relax you can also do **deep breathing**.
- Next try **visual imagery** by closing your eyes.
- To avoid all the panicky talk next try the “**Palming**” technique by place your palms on your forehead. Think of a place that is very relaxing to you. Pretend you are there.
- **Mindfulness, Mindset (growth, fixed), Self-Efficacy, Cognitive-Positive self talk**

The other benefit is that the other students will think you have a headache and will leave you alone.
Strategies to Improve Motivation

- Change their learned helplessness to positive math self-efficacy - Locus of Control
- Student see value in completing math courses - Intrinsic motivation – Like to learn math
  Extrinsic motivation - More math more money, financial aid, graduate
- Students take the Math Study Skills Evaluation - and practice skills – Attribution Theory
- Mindset - Fixed Vs. Growth
- Students improve their math learning and testing skills – Train them for success = Motivation
Locus of Control

• Internal

• External

• Short – term goals

• How achieve short-term goal

• Long-term Goals

• How achieve long-term
Math/STEM Study Skills Evaluation

• Paul, the overall result of your evaluation is a score of 69. A score of 79 and below means you need to improve your math study skills and this could be the main reason you may have had having difficulty. You can improve these skills and become more successful in math (motivation). Why?

• You have a score of 63 in Study Effectively, which measures the understanding that studying for math, is different than other subjects. It also measures your effective use of study place(s), study schedules, study tools, and motivation. WAM reference chapters are 1 and 3.

• You have a score of 67 in Memory and Learning, which measures the understanding of learning styles, learning process, as well as developing a learning plan and memory strategies. WAM reference chapter is 6.

• You have a score of 63 in Reading and Homework, which measures the understanding of the syllabus, along with developing reading and homework strategies to improve math learning. The WAM reference chapters are 3 and 4.

• You have a score of 57 in Classroom Learning, which measures the ability to develop listening strategies, note-taking systems as well as the ability to ask questions. The WAM reference chapter is 2.
Math Study Skills Evaluation

• You have a score of 47 in Test Anxiety and Test-Taking, which measures the understanding of the effects of test anxiety, how to reduce test anxiety, how to take tests and how to analyze test results. WAM chapter is 5.

Response #1
My habit is that I:

Response 1: seldom study math every school day. Your response indicates that you may not understand that math has a sequential learning pattern. A sequential learning pattern means material learned one day is used the next day and the next day and so forth. That means putting off studying math will lead to poor math grades. You need to study and do your homework before each class. You need to read pp. 16-23 in Winning at Math.

• Question #2
When learning math:

Response: 2 Somewhat believe that math study skills, test anxiety and motivation represent about 25% to 41% of my grade. Your response indicates that you may not totally understand the different factors that contribute to learning math and your grades. The major factors contributing to learning math and grades are math knowledge (50%), math instruction (25%) and student learning (25% – 41%). You need to read 146 – 147 in Winning at Math.
Mindset Strategies

- Mindset – Core belief about how well a person can learn a subject - Math
  - Past experiences can affect the belief
  - Society can affect that belief
  - Parents/instructors can affect that belief

- Fixed mindsets – Belief of only having a certain amount of ability to learn

- Growth mindsets – Belief that learning ability can be improved

- Improving growth mindset - Motivation, self-efficacy, learning & analysis skills, positive feedback, **catch them doing something right**
Improving Student Learning

- How virtual learning is different
- Learning platforms - Desmos, Wonder.Me. and others, Julie Phelps AMATYC Creating Engagement Webinar (1-22-21)
- Active Learning
- Self-directed learning
- Virtual Math Study Skills System
  - Time management
  - Homework note taking
  - Test-taking
- Virtual tutees strategies
Active Learning

- Faculty to student or student to student
- Virtual break out rooms for group work – Visit each room
  During virtual class
  Set up study groups, group projects just for students
- Think-pair-share
- Jigsaw
- One minute response
- Base groups
## Virtual Study System Overview

Students need strategies for the following learning activities. How do they study, learn and demonstrate?

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Homework</th>
<th>Test Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textbooks</strong></td>
<td><strong>Tutoring</strong></td>
<td><strong>Test Preparation</strong></td>
</tr>
<tr>
<td>Class Note-taking System</td>
<td>Time Management and organization</td>
<td>Review Lecture and Homework Notes</td>
</tr>
<tr>
<td>Textbook Learning System – Read and Take Notes</td>
<td>Homework Note- Taking</td>
<td>Practice Tests</td>
</tr>
<tr>
<td>Videos</td>
<td>Apps/Web Sites</td>
<td>Test taking strategies</td>
</tr>
<tr>
<td></td>
<td>Group Chat Rooms</td>
<td>Ten Test Taking Steps</td>
</tr>
<tr>
<td></td>
<td>Tutor Strategies</td>
<td>Test Analysis</td>
</tr>
</tbody>
</table>
Improve Students’ Time Management

- Plan use of daily time – Study schedule
- Weekly study goal sheet – A to do list
- Electronic planners- [Winning at Math Electronic Time Management]
- Smartphones – Set study time reminder
- **Study math right after synchronous or asynchronous lecture** – Meet students
- **Math homework is the first to schedule** – Right after lecture
- Organize study area, show schedule and ZOOM/Skype/FaceTime groups
## Online Homework Three Column Note-Taking Method

Assignment: **Student need to show notes during individual tutor or virtual sessions**

<table>
<thead>
<tr>
<th>Key Words/Rules/Properties</th>
<th>Examples/Problem Steps</th>
<th>Explanations and questions I need to ask myself</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words from the right side of problem</td>
<td>The problem</td>
<td>Sentences that describe the next step or sentences at the end of the problem</td>
</tr>
</tbody>
</table>
Ten Steps for Taking Online Tests

1. Memory Data Dump
2. Preview Test
3. 2nd Memory Data Dump
4. Test Progress Schedule
5. Answer Easy Questions
6. Skip Difficult Questions
7. Review Skipped Questions
8. Guess at Remaining Questions
9. Review All of the Test
10. Use all the Test Time

Online tests- Show how to take tests
Reason to turn in scratch paper

“The first student done with the test may not be the smartest in the class. Often the smart students are the ones that take the entire time to make sure they do everything accurately. Be brave. Stay in the room and make sure you complete everything accurately.”
Remote Tutoring Concerns

- Getting students to come
- Harder to visualize student problems
- Students not using available resources
- Stress and anxiety of virtual tutoring
- Students only want answers
- Student motivation
- Can not tell if student really understands
- Internet speed, access and ZOOM skills
- Student taking exams & accessing ZOOM
Remote Students Concerns About Tutoring

- Not used to having access to online help at 3 am
- Not able to show work—Talk through steps
- Students feel rushed or pressured
- Learning how to use ZOOM effectively
- Scheduling of their time
- Motivational factor—Stigma of tutoring
- Technical issues and distractions
- Think they are limited to what can ask
- Not able to write down on paper what both sides are explaining
Student Strategies for Remote Tutoring

- Students tell tutor or instructor their learning preference
- Student ask tutor or instructor what they do when they get stuck
- Students show tutor their problem steps – Hold up to camera or take a picture and send or use small white board
- Students tell tutors where they got stuck on a problem – Hold up problem to camera or text picture
Student Strategies for Remote Tutoring

• Students “Talk out loud” to tutor to show thinking and vice versa
• Students take picture/screen print of solved problems – Sent to instructor or tutor
• Students record the tutor session
• Student show tutor their lecture and homework notes – Should tutor like instructor
• Students ask how to use other resources such as apps and links
Apps

Recording/Note-taking apps
- Smart Voice Recorder – Recorder and label recording
- Evernote – Type in notes, take photo of notes, record notes, attach a file, hand write and sync with computer.
- Voice Recorder - can record information on your smartphone.
- Photos - Can show photos of problems from the board or any written material to your tutor or instructor.
- Video Recorded - Can video record lectures or tutoring.

Smart Pens - records exactly what you hear and stores it.
Sonocent – can record lectures, turns audio into visual blocks; colored highlighting, and combined photos and text notes.
Apps and Website

Learning Math and Checking Answers:

- **Algebra Tutor** - solves arithmetic and algebra problems.
- **Algeo** - squares, sin, cos, graphing solutions, and f(x).
- **Photomath** - take pictures of equations and solves them on your phone.

- **Web Math Algebra** - [https://tinyurl.com/c4bo7gf](https://tinyurl.com/c4bo7gf)
  - This is a free site to help solve algebra problems.
- **Wolfram Alpha** - [http://www.wolframalpha.com/](http://www.wolframalpha.com/) - This site does all math and STEM levels.
- **Khan academy** - Has videos on solving math problems
- **YouTube** - Has videos on doing all levels of math and STEM
My Success Plan

Repeating students need to show you this plan
Semester: Fall 2020

A. Student Information:
   Name: Paula College, Sophomore

B. Course: Intermediate Algebra

C. Learning Information: Visual learner, 60 on the Math Study Skills Evaluation

D. Semester Goals: B in Beginning Algebra, 3.0 GPA, improve math study skills, attend math lab three times a week, attend three tutor sessions a week, visit math instructor
My Success Plan

E. Study Strategies: Use classroom note-taking system, develop a math glossary, use online note-taking system (three click), learn relaxation techniques, use online test-taking system, analyze test results, use apps to record tutor instructions. 
http://www.wolframalpha.com/ to check my homework

F. Motivation Strategies: see my instructor, rewards for competing short-term goals, tell myself positive statements, decrease my procrastination, review goals for my major.

G. Mentor: Denise Turcot - LAC
Contact Us for Follow-up Conversations

p.nolting.phd@gmail.com
941-746-1645
www.academicsuccess.com
Upcoming 4th National Mathematics Summit
June 14 & 15, 2021

Planning Leadership Team
Annette Cook, Paul Nolting, Julie Phelps and Nancy Sattler

Steering Committee
Christina Cobb and Denise Lujan (NOSS)
Rochelle Beatty, Kathryn Van Wagoner, and Laura Watkins (AMATYC)
Connie Richardson and Paula Talley (Charles A. Dana Center)
Ann Edwards (Carnegie Math Pathways/WestEd)
April Strom (MAA)
The 4th National Math Summit begins at 1:00 p.m. on Monday, June 14th, and features keynote speaker, Jenna Carpenter, concurrent sessions, and more. The program will conclude Tuesday, June 15th 5:00 p.m. This is a pre-conference to the NOSS 2021 conference and requires separate registration (https://thenoss.org/Math-Summit/).

The Math Summit is sponsored by AMATYC, NOSS, and Paul Nolting. Supporting partners include: Charles A. Dana Center, Carnegie Math Pathways/WestEd, and the MAA.
April - Professional Development and Department Issues in a Pandemic  
Presenters: Christine Mirbaha, Linda Braddy and Behnaz Rouhani  
Date: 4/27/2021 at 1 pm Eastern

May - Topic: Student Engagement  
Presenter: MAA representative  
Date: TBD

Watch for more information!