New Challenges and Solutions for Math Success
Focusing on Students with SLD, ADHD, TBI, PTS, TBI, LI, ID and Autism: Strategies, Accommodations, Memory Aids, Course Substitutions, and OCR Rulings

AHEAD
7-21 – 22
11:00 – 12:30
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Workshop Agenda

- Definition of math and other disabilities
- Research on success variables
- Improving student learning and success to decrease course substitution requests
- Decreasing test anxiety
- Assessment of math study skills
- Teaching math study skills strategies
- Types of disabilities and characteristics
- Cognitive processing deficits relationship to math success

Workshop Agenda (cont'd)

- Stages of Memory Diagnostics
- Educational Accommodations
- Testing Accommodations
- Office of Civil Rights cases
- Math course substitutions
- Course substitution process
- Summary and questions
### Definitions of Math and Other Disabilities

<table>
<thead>
<tr>
<th>Disability</th>
<th>Description</th>
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<tbody>
<tr>
<td>Acalculia</td>
<td>Inability to read or write numbers in that individuals can not perform calculations or having impaired spatial organization.</td>
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<tr>
<td>Dyscalculia</td>
<td>Failure to develop math (arithmetic) competences that is not due to a brain injury or mental impairment.</td>
</tr>
<tr>
<td>Dysalgebraia</td>
<td>Students with average to above average IQ can master calculations but can not master algebra (Nolting, 2000).</td>
</tr>
<tr>
<td>Dyslexia</td>
<td>Is not a math learning disability but may cause math learning problems due to misreading or miscopying numbers and letters.</td>
</tr>
<tr>
<td>Dysgraphia</td>
<td>Is not a math disability but may cause math learning problems due to poor handwriting and copying from the board.</td>
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</table>

### Learning Concerns Impacting Grades

- Mismatch of teaching styles and some **co-requisite design**
- Lack of math study skills and test anxiety
- Specific Learning Disorder (LD) – Processing deficits in Short-Term Memory (STM), or Short-term Working Memory (STWM), Long Term Memory (LTM) or Fluid Reasoning (FR)
- Attention Deficit Hyperactivity Disorder (ADHD) - STWM, executive function, attention/concentration problems/co-morbidity
- Traumatic Brain Injury (TBI) - STWM, executive function, FR, may impact visual/spatial, processing, Receptive and expressive language

### Learning Concerns Affecting Grades

- Posttraumatic Stress (PTS) – Anxiety that effects attending class, tutor session and short-term working memory
- Autism – Social interaction difficulty, lack of class participation, problems with group work in class
- Language Impairments - Expressive and receptive in class and instructor meetings
- Intellectual Disability (ID) – Deficits in intellectual and adaptive functioning to understand math concepts and remember facts
Variables Contributing to Student Academic Achievement (Bloom, 1976; Zientek, 2013)

- **Cognitive Entry Level Skills & IQ** (Prerequisite Skills /Learning) - 34% to 50% of the grade
  - Aptitude, Learning Speed, Ability to learn math concepts and generalize, Working memory, Long-term memory, Abstract

- **Affective/non-cognitive Characteristics** – 25% to 41% of the grade
  - Math self-efficacy, Math study skills, Test-taking, Anxiety/PTS, Motivation, Mindfulness, Mindset, Student Success Plan

- **Quality of Instruction** - Less than 25% of the grade
  - Classroom, Tutoring, Co-requisite design, Lecture, Collaboration, Engagement, Training, Virtual, learning styles

Maximizing Non-Cognitive Skills

- Math anxiety: who has it, why it develops, and how to guard against it (Maloney and Beilock, 2012) – Math begins early in school and is caused by social factors and ability to learn math. Need to **address anxiety and affective not math skills**
- Co-requisite 1-hour math study skills course for first 8 weeks + Basic Algebra course – MGF 1050 (Students repeated Basic Algebra 1-4 times took math study skills course.) **Significant at .05 p level** (Nolting, 1986, 1990).
- Implementing a Math Study Skills Course (Lewis, 2014, unpublished master thesis). **Significant grade increase.**
- Student Perceived Interference to College and Mathematics Success (Acee, 2017). - Students indicated that 71% of their interference to college success was mathematics, strategic learning, and economics.

Success of Students Taking Algebra and Life Skills/Success Course Separately with Math Study Skills – Teach this Course

<table>
<thead>
<tr>
<th>Semester</th>
<th>Pilot</th>
<th>Non-pilot</th>
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</thead>
<tbody>
<tr>
<td>Fall 03</td>
<td>80%</td>
<td>59%</td>
</tr>
<tr>
<td>Spring 04</td>
<td>76%</td>
<td>52%</td>
</tr>
<tr>
<td>Fall 04</td>
<td>82%</td>
<td>53%</td>
</tr>
<tr>
<td>Spring 05</td>
<td>67%</td>
<td>51%</td>
</tr>
</tbody>
</table>
How Learning Math is Different In College

- Curriculum progresses four times as fast. Six-week courses are six times.
- Co-requisite course may go eight times a fast (teaching two courses)
- Most deep learning is outside class.
- Math requires sequential learning
- Students must demonstrate concepts
- Math is a foreign language.
- Math is like a sport, puzzle or music.
- It is socially acceptable to fail math.
- Virtual/modular courses require more independent learning.
- Math will need more study skills, accommodations, effort and maybe course substitution.
- More math more money.

Learning math requires special study strategies and habits – Let the students discuss attitudes towards math.

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.
- Mindset (growth, fixed), Self-Efficacy, Cognitive-Positive self talk, Mindfulness

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

Math Study Skills Evaluation–VII-RV-PLUS

1. Personalized, diagnostic, prescriptive & motivational
2. Make study skills suggestions
3. Computer print out suggests Winning at Math chapters and page numbers

Math study skill can also improve the success of students with disabilities


- 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 skill, and this could be the main reason you may have had having difficulty.
  - 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 preferences, 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 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.

Online 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>
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<tbody>
<tr>
<td>Textbooks</td>
<td>Tutoring</td>
<td>Tests</td>
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<tr>
<td>Class Note-taking System</td>
<td>Time Management and organization</td>
<td>Review Lecture and Homework Notes</td>
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<tr>
<td>Textbook Learning System - Read and Take Notes</td>
<td>Homework Note-taking</td>
<td>Practice Tests</td>
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<tr>
<td>Video Streams</td>
<td>Apps/Web Sites</td>
<td>Ten Test Taking Steps</td>
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<td></td>
<td>Group Chat Rooms</td>
<td>Test Analysis</td>
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<td></td>
<td>Tutor Strategies</td>
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</tbody>
</table>

Class/Video Math Note-taking System Three Column Method

Math/Science Problem

<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>
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**Apps & Resources for Note-taking**

**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 or video Recorder - can record information on your smart phone.
  - Photos - Can show photos of problems from the board or any written material to your tutor or instructor.

**Otter AI** - Can video record lectures or tutoring and turn into PDF.

**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.

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**Online Homework Three Column Note-Taking Method - Example**

Assignment: If you click more than twice then write down problem.

<table>
<thead>
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<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>

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**Apps for Learning Math**

- EquaTI0-Math/STEM instructors/students creates math formulas, equations & graphs; dictate, write, type, export

- 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 problem

- Wolfram Alpha - [http://www.wolframalpha.com/](http://www.wolframalpha.com/) - This site does all math and science levels.
Ten Steps for Taking Classroom or Online Tests

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

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 Peretration

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.

Collaborate with math department & LRC to teach math study skills: Why? Educational Accommodations- Improves math success- Don’t need to be math instructor

Cognitive Processing Skills Significantly Impacting Math Learning – WAIS-IV

Verbal Comprehension Index – Some subtests
  Vocabulary & Information – Long-term memory – Yes

Perceptual Reasoning Index – Some Subtests
  Block Design, Matrix Reasoning & Visual Puzzles – Fluid/Abstract reasoning – Yes

Working Memory Index – All Subtest
  Digit Span & Arithmetic – Working Memory – Yes

Processing Speed Index – All Subtests
  Symbol Search & Coding – Visual processing speed – Yes
Cognitive Processing Skills Significantly Impacting Math Learning – WJ-IV-COG

Auditory Processing - No
Cognitive Processing Speed - Yes
Visual Processing – Maybe
Short-term Working Memory - Yes
Long-term Storage and Retrieval - Maybe
Comprehension-Knowledge (Long – term Memory) – Yes
Fluid Reasoning (Abstract) – Yes- Most serious problem

Specific Learning Disabilities Characteristics

Difficulty:
• remembering the multiplication tables or facts
• recalling sequence of problem steps/operations
• Understanding abstract concepts
• Reversal of numbers or letters such as 45 and 54 or 123 to 321 or 231and b for d and + for x
• Miss coping problems from the board, online texts or homework
• Homework problems look like “chicken scratch”
• Demonstrates knowledge in classroom but not on tests
• Not completing the test - what is done is mostly correct
• Poor math study skills and organization

*May not pass Elementary/Intermediate but may pass higher level courses measuring more verbal than abstract reasoning skills

Auditory Processing Deficit

Definition: Students with auditory processing deficits have difficulty synthesizing words and understanding words in noisy classrooms. These students may misinterpret words or not “hear” the words. This is not a hearing problem or short-term working memory problem. It is a problem of misinterpretation of words spoken words.

Primary Affected Areas:
sensory register, short- term working memory – Not significantly related to math but with LI

Observable Behaviors: students misunderstanding math vocabulary; difficulty solving word problems; difficulty reading the text and understanding lectures.
Cognitive Processing Speed Deficit

Definitions: Students with a visual processing speed deficit have great difficulty quickly recognizing numbers and conceptually similar visual objects. Student with visual speed processing deficits can visually process information but very slowly.

Primary Affected Areas: sensory input & register; significantly related to math – ADHD, PTS, TBI?, SLD?

Common Observable Behaviors: re-reading sentences & paragraphs; scanty notes or no notes at all; very slow in completing homework, very slow in doing online homework, very slow in completing tests and having difficulty quickly reading numbers, variables, math symbols, writing notes and solving problems. Problems with automaticity and may be dyslexic.

Visual Processing Deficit

Definitions: A student with a visual-spatial processing disorder has great difficulty in recognizing and synthesizing visual information. The student also has difficulty remembering visual information and remembering it in the correct order.

Primary Affected Areas: sensory input & register; short-term working memory – Mixed research on math learning – SLD?, LI?

Common Observable Behaviors: re-reading sentences & paragraphs; “chicken scratch” notes or no notes at all; problem solutions all over the page; numbers miss-aligned; copying down incorrectly; difficulty reading tutor/instructor handwriting; misreading variables and numbers such as b for d or 9 as a 6 or + for x, having difficulty quickly recognizing numbers, variables and math symbols. Student could be dyslexic.

Short-term Working Memory Processing Deficit

Primary Affected Areas (continued):

Any learning task that involves using complex pieces of information or concepts; math problems that using multiple concepts at the same time to solve; significantly related to math TBI, PTS, ADHD (executive function), SLD?

Observable Behavior: Forgetting oral instructions and writing down problem steps. Ask question about problems steps. Appears not to be paying attention. May have difficulty working in groups. Confusion on multiple step assignments; Student may understand each concept but can not organize the steps in order to solve the problem. Tired and frustrated after a short period of studying or working problems.
Short- term Working Memory Processing Deficit (cont'd)

Primary Affected Areas (continued):
Any learning task that involves using complex pieces of information or concepts; math problems that using multiple concepts at the same time to solve; significantly related to math TBI, PTS, ADHD (executive function), SLD?

Observable Behavior: Forgetting oral instructions and writing down problem steps. Ask question about problems steps. Appears not to be paying attention. May have difficulty working in groups. Confusion on multiple step assignments; Student may understand each concept but can not organize the steps in order to solve the problem. Tired and frustrated after a short period of studying or working problems.

Long-Term Storage and Retrieval Processing Deficit

Definitions: Students with LTSR deficits have minimal ability to input or retrieve information in active memory in order to understand concepts. The LSTR process pertains to speed and volume (fluency) of putting information into/taking it out of long-term memory and abstract memory.

Primary Affected Areas: Abstract/fluid reasoning, Long-term memory; Memory output; Any learning task that involves using several pieces of information or concepts; difficulty answering questions; recalling information; maybe significant to math: TBI, PTS, SLD?

Observable Behavior: Confusion on multiple step assignments; Brain Traffic Jam; tired after a short period of studying; spaced out look; student understands step by step problem solving but can not put all the steps together to solve the next problem.

Comprehension-Knowledge (LTM) Processing Deficit

Definition: Students with long-term memory problems have minimal ability to store information for a long period of time. The length of time for which students can hold information may vary. For instance, a student may learn material during one session and not remember it three sessions later. Also, it could be that a student remembers how to work a math problem one day and then forgets the next day. Problems in remember math facts.

Primary Affected Areas: working memory, abstract reasoning and long-term retrieval; significantly related to math - SLD?, ID

Observable Behaviors: holes in the math facts such as multiplication tables, formulas, algorithms, vocabulary; foundation of concepts needed for additional learning --- must relearn information but forgets information again — Cannot retain information.
**Fluid / Abstract Reasoning Processing Deficit**

**Definition:** Abstract reasoning deficit keep students from being able to form math concepts, solve abstract problems that include novel situations and extrapolating information. It is the inability to identify relationships with unfamiliar concepts and making inferences. Deficits are in understand or generalizing math concepts or both.

**Primary Affected Areas:**
- short-term working memory, long term memory, memory output, critical thinking level skills

**Observable Behaviors:**
- need for repeated instruction as if information was never learned; repeated blank looks; ability to mimic processes but not apply them, not making inferential leaps; can’t generate alternate problem-solving strategies; repeating math several time: good GPA

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**ADHD Characteristics**

- Difficulty concentrating in the classroom
- Easily distracted in class leading to missed problem steps and confusion
- Problems with short-term memory—Need steps repeated
- Difficulty connecting problems steps to understand concept or rule
- Being impulsive in class and not completing homework
- Difficulty taking notes and concentrating on lecture
- Poor time management and organizations
- Procrastination
- Easily distracted and losse concentration during tests
- Problems with executive function — (Working memory, concentration)
- Comorbidity with other disabilities (SLD, anxiety)

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**ADHD Processing Deficits Impacted**

- **Cognitive Processing Speed**
  
  Definition: Students with a visual processing speed deficit have great difficulty quickly recognizing numbers and conceptually similar visual objects. Student with visual speed processing deficits can visually process information but very slowly.

- **Short-term Working Memory**
  
  Definition: Short-term working memory processing deficit is now considered a combination of short-term memory and working memory. This processing area holds both auditory and visual memory long enough to manipulate and actively work on several activities at the same time. Student with this deficit have minimal ability to retain information to work the problem. It how much RAM a student has.

  75%-50% Comorbidity with other disabilities (SLD, anxiety, depression)
**TBI & MTBI Characteristics**

- May be Vet or students who had a car accident
- Symptoms can be mild, moderate, severe
- Previous minor problems (mental health) worst
- Several MTBI is as bad as a TBI
- May or may not improve over time
- Problems in recognizing important information
- Problems with short-term working memory
- Problems in taking notes
- Problems with concentration and abstract reasoning
- Frustration in remembering problems steps
- May used to know math concept but forgot

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**TBI & MTBI Processing Deficits Impacted**

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- **Fluid/Abstract Reasoning**
  
  **Definition:** Abstract reasoning deficit keep students from being able to form math concepts, solve abstract problems that include novel situations and extrapolating information. It is the inability to identify relationships with unfamiliar concept, making inference or understand or generalizing concepts.

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**PTS Characteristics**

- May be Vet or other students who had a stressful event
- Avoiding going to class—to many people in class/college
- Sitting in the back corner of room
- Leaving the classroom
- Difficulty concentrating to follow steps of problem
- Hyper vigilance (on constant “red alert”) – distracted by other in and outside the classroom
- Not wanting to see instructor-office to small
- Not want to go to lab – to many people and noise
- Has difficulty working in groups
- Processes information slowly – Slow note-taking
- Anxiety disrupts short-term working memory
- Has anxiety and concentration problems: On homework and tests
PTS Processing Deficits Impacted

• **Cognitive Processing Speed**
  Description: Students with a visual processing speed deficit have great difficulty quickly recognizing numbers and conceptually similar visual objects. Students with visual processing deficits can visually process information but very slowly.

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Autism Characteristics

• Students perceive the world through a different perspective.

• Many students develop rigid behaviors associated with learning and tutoring. Students want the same chair and tutor.

• Once routines are established, they are very hard to break.

• Students may fixate on one concept or idea repetitively.

• Many are very bright and are attracted to logic and rules.

• Students may not look you in the eye, however, are concentrating and learning. Show apps and Web sites.

• Students have issues with social interaction and communication skills causing group learning problems.

Autism Characteristics (cont’d)

• Student can be easily distracted. Difficulty taking notes.

• Student may have less tolerance for other students.

• Students may solve math problems in their head, but do not know how they got the answer. Show them the steps.

• Ask students how they learn best – Wait for answer.

• Collaboration and support among instructors and DRO
Language Impairments

A chronic condition with difficulty in acquiring language due to impairments with language comprehension, language expression or both. The language impairment may affect the individual across all language modalities such as speaking/listening, reading/writing as well as non-spoken or non-written forms of language such as sign language.

Language Impairment Characteristics

- **Math Literacy:** Math is language too... Re-thinking our approach
  - Students perceive the world through a different perspective. Consider receptive and expressive language
  - Students having difficulty in receptive language may not be able to verbally process the lectures at a fast rate to understand information or be able to take good notes
  - Students having difficulty in receptive language may have difficulty reading and understanding the textbook, vocabulary and online homework
  - Students with expressive language may not be able to formulate questions for the instructor fast enough before going to the next step
  - Collaboration and support among instructors and DRO regarding communications
  - Consider the use of concepts of math with hands on learning
  - Statistics may not be an appropriate substitution due to the language-based curriculum involved.

Language Impairment Deficits Impacted

- **Cognitive Processing Speed**
  - Definition: Students with a visual processing speed deficit have great difficulty quickly recognizing numbers and conceptually similar visual objects. Students with visual speed processing deficits can visually process information but very slowly.

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Intellectual Disability Characteristics

- A student with an Intellectual Disability (intellectual developmental disorder) often demonstrated deficits in general mental abilities such as short-term working memory, long-term memory, abstract thinking, reasoning, problem solving, planning, and academic learning, all areas critical in learning math.
- Students have difficulty in:
  - Note-taking
  - Understanding math vocabulary
  - Following lectures and directions
  - Completing homework assignments
  - Remembering formulas
  - Solving math problems due to abstract reasoning issues and/or poor generalization of concepts to novel math problems
- Adaptive functioning is the basis used for identifying various levels of severity for an intellectual disability.
- Levels of support may vary between mild, moderate, severe, and profound. WAIS-IV and WJ-IV ID IQ scores are below 80.

Intellectual Disability Characteristics contd.

- A student with an Intellectual Disability (intellectual developmental disorder) often demonstrated deficits in general mental abilities such as abstract thinking, reasoning, problem solving, planning, abstract thinking and academic learning, all areas critical in learning math. Adaptive functioning is the basis used for identifying various levels of severity for an intellectual disability, and levels of support may vary between mild, moderate, severe, and profound. In general, even for the student with mild intellectual disability, supports are needed in basic complex daily living tasks, banking, money management, and tasks involving conceptual skills.

Some examples of strategies to work with this population: (These may take place in a program specifically designed with this population in mind, ex. Unique Abilities)

- Multiple hands-on math tools, applications, methods and materials
- Step by step instruction at a slower pace
- Differentiated instruction without complex direction
- Thorough descriptions and examples of cause and effect utilizing visuals or concrete examples
- Teaching patterns and routine with manipulatives or concrete examples, then introducing numbers to those concepts
- Teaching geometric figures through common, everyday objects such as a ball, Rubik's Cube, can of soup

Stage of Memory and Diagnostic

Sensory Register and Input Handout

- Sensory input is when an individual physically takes in the information using any of the human senses. Not attending class, attention:
  - ADHD, TBI, PTS

- Sensory register is when the mind neurologically accepts the information. The information captured by our senses is translated into an entity that our brain can register. Note-taking cues – What is important to remember and write down:
  - ADHD, TBI, PTS

Forgetting = Information not input or registered.
What Does It Take to Really Learn?

Short-term Working Memory
- STWM is like RAM in a computer.
- It holds a series of thoughts from sensory register to either work on problems or transfer the information to long-term memory and abstract reasoning. Ability to recall information and "work" with the information to solve a problem.
- Ability work on several concepts at a time to complete a task. Doing homework and remember and using information during a test. Practice to get into and recall LTM/Abstract:
- ADHD, TBI, PTS, SLD?, ID

Forgetting = Information not Understood

What Does It Take to Really Learn?

Long-term Storage and Retrieval
Send and recalls information to and from short-term working memory to long-term memory and abstract reasoning. It is the information highway of the brain. The size and speed of the highway matters. ADHD?, SLD?, ID

Forgetting = Information not held on to or recorded

What Does It Take to Really Learn?

Long-term memory
Long-term memory is a storehouse of material that is retained for long periods of time. It is recalled into working memory to complete learning tasks like solving problems, writing papers, or creating a musical composition.

The ability to remember facts such a vocabulary, rules, formulas and concepts.
- LD?, LI, ID

Forgetting = Information not rehearsed/reviewed
What Does It Take to Really Learn?

Abstract Reasoning

Abstract Reasoning uses recalled concepts to make new meaning and understanding without using language, either spoken, written, or in thought. This is the most difficult stage to understand.

The ability to use concepts & understand symbolic logic.
TBI, LD?, ID, ADHD – Comorbidity?

Memory Output

Finally, in order to demonstrate understanding, an individual must recall (memory output) learned facts and/or concepts in some form and express the knowledge. This takes place in the form of tests, papers, or presentations.

Recall information - Problems with test anxiety & test taking skills
TBI, PTS, ADHD, Anxiety, LD?, ID
Output problems may or may not be accommodated

Strategical Approaches for Academic Support

1. Record sequential steps or questions that the student and tutor have created
2. Place same information on note cards
3. Put information cues to music or rhythmic recitation
4. Mental cheat sheets
5. Construct tutoring session to include student giving verbal and/or visual feedback.
6. Draw pictures for cueing
7. Color code numbers and symbols - multi color pen
8. Apps – recording, pictures and math problem solving
9. Train tutors/Success Coaches
**Educational Accommodations and Strategies**

1. Graph paper
2. Formula sheets/cards
3. Develop mental cheat sheets
4. Color assign numbers and symbols
5. Problem on left side of paper and calculations on right
6. Use capital letters with a lot of white space
7. Graphing and talking calculators
8. Apps - record, take pictures, solve math problems
9. Math Study Skills Evaluation and My Math Success Plan text
10. Smart Pen, Sonocent, Otter AI
11. Virtual manipulatives sites
12. 3-D printers
13. Text to speech or speech to text options

**Student Math Success Plan: Services, math study/test-taking strategies, accommodations – Put in file**

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**Math Testing Accommodations**

- Extended time
- Private quiet test area
- Formula sheet
- Fact sheet (teacher approved)
- **Memory aids**: Key word list, Lecture notes, Definitions, Sample questions, Diagrams: Florida State Univ.
- Clarification of test questions
- Manipulatives
- Scribe and white board or Smart Board
- Pictures of problem steps
- One or two problems per page
- Break down test to sections/days with new memory data dump every time – Hand in scratch paper
- Math and Disability Handbook 2ed (Nolting, 2022)

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**Student Case Review Questions For Course Subs**

(Have a consistent policy and procedure)

- Has the student already attempted math course?
- What are the student’s processing strengths?
- What are the student’s processing deficits?
- Are the mathematics defects severe enough to warrant a course substitution?
- What are your recommendations about the course substitution? **You are the expert!**
- If denied, what is the appeal process?
- Appeal never goes to the president!
Alternative Math Course Sequence

- Elementary Algebra → Statistics
- Elementary Algebra → Liberal Arts Math
- Elementary Algebra → Topics in Math
- Co-requisite redesigns now bypass DE courses so make it an accommodation
- Student should not be repeating algebra

Significant CHC Factors & Clinical Clusters for Course Substitution

- Working Memory → Not Enough RAM
- Long-Term Memory → Not Enough Facts
- Abstract Reasoning → Not Enough Logic
- TBI, MTBI and PTSD – CHC and Clinical Clusters
- Can use research in Math and Disabilities Handbook (Nolting, 2022) to support accommodations and course substitutions – Sold by AHEAD

Math/Science Course Substitutions

- Introduction to Computers
- Accounting I
- Macro-economics
- Philosophy
- Earth/Space Science
- Math Courses-Lower
- Environmental Science
- Business math
- Astronomy
- Oceanography
- Physical Science
- Major Course
- Elective math course
- Students still apply for courses subs. Virtual, or ID does not matter
Court cases on applying for course sub or not allowing accommodations – Apply for course sub when accepted (due process), extended homework time, recording, formula sheets, brail text, committee make and Director as expert.

ADHD documentation - Students only need DMS code and clinical interview – No test scores- Forsyth Technical Community College

Extended assessment time – Cannot just say no – Need to review each case individually – DRO Director makes the decision -ADHD, TBI, LD- Surry College

Course substitution – When to apply for sub —Cannot make repeat or fail, 3 areas: 1. Insurmountable to pass math, 2. Gray area-can not predict with accommodations can pass, 3. Disability processing deficits not correlated with math SLD, reasonable accommodations not preclude success in a particular math course with accommodations. Made to hire outside consultant on dyscalculia - San Antonio College:

Denial of note-taking services –
Student was approved for note-taking services for two semester for two course. Note-taking was not provided and did not discuss alternatives. University was found in violation and was told to pay for note-taking services or pay for transcription services- UC- Berkeley

Need effective note-taker and reader- Student was provided inadequate notes and test-reader in physics. Instructor indicated that the test reader/scribe was not fluent in physics symbols/vocabulary. College was not found in violation due to Regulation Agreement. Agreed to provide effective note-taking/test reading. – Austin CC

Denial of a course substitution because student had to first complete developmental math courses –
Student’s mother filed an OCR grievance for her daughter due to the denial of a math course waiver. She was denied the use of a calculator for the placement test. Student was placed into a non-credit math course and failed. The university policy is to not grant any math course waivers. There was no discussion of a course substitution process. She only attended a few tutor session because the tutoring was not helping her. Since the student could not waive the non-credit math course, she could not take a higher-level math course such as Liberal Arts or Education 18 that had little or no calculations. During the investigation OCR did find other issues such as not following their own policy and lack of due process. Then California eliminated placement testing so the student could take Education 18 which is a math general education course. The University entered into a Resolution Agreement which means they were not found in violation. OCR still had the university to for fill five items in the resolution agreements. CA State University – Sacramento-2018.

Course substitution with Intellectual Disabilities? OCR cases none
New Office of Civil Rights Cases

New documentation of current OCR Letters and Resolution Agreements:

- Alamo Colleges District - Northwest Vista College, Texas, 2021 – Case No. 06202347
  - Summary of the Evidence Obtained to Date
  - Evidence obtained by OCR indicates that the Student began attending the College in the xxx substitution semester. The Student first registered with the Access Office on xxxxxx xx xxx. The Access Office determined the Student to be a qualified student with a disability and began providing accommodations for the Student during the xxx substitution semester. The accommodations were renewed for the xxx xxxxxx xxx substitution xxx xxxxxx x xxx.
  - Records provided by the College reveal that the Student’s accommodations included xxxxxxx xxxxxx xxxxxxx xxxxxxxxxx, xxx xxxxxx xx xxxx xxxxxxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx xxxxxxxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx x xxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx x xxxxxx; x xxx x xxxxxx xx xxxx xxxxxxxxxx xxxxxxxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx xxxxxxxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx xxxxxxxxxx; xxx xxxxxx xx xxxx xxxxxxxxxx xxxxxxxxxx.

Student Case Reviews

- Course substitution case with WAIS-IV scores
- Course substitution case with WJ-IV-COG scores
- Course substitution case for ID student

Resources


Winning at Math: Your Guide to Learning Mathematics Through Successful Study Skills, Nolting sixth edition. AHEAD has this product.

My Math Success Plan (Nolting, 2013) which is a student workbook demonstrating how disabilities affect math learning and teaches math study skills (ebook or print).

Teach students to become Self-Directed Learners: https://my amatyc.org/blog/paul-nolting/2020/08/25/self-directed-learning-
tools-and-current-research

Additional research on math study skills by Dr. Paul Nolting and others http://www.academicsuccess.com
Presenter’s Contact Information

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