Academic Adaptations for Adolescents with Autism and Asperger's

Math

For use in ASD Nest middle and high schools

INTRODUCTION

Middle and high school students with ASD may struggle with academic expectations across subjects. Though bright, there can be content or skills that can pose a challenge to these students.

These struggles, however, can often be predicted by considering underlying challenges that students with ASD face. Teachers can also support students by incorporating their strengths and areas of interest.

The A5: Academic Adaptations for Adolescents with Autism and Asperger's provides specific strategies to help support students in the ASD Nest program. Along with the *Nest Essentials* and the *Expanded Nest Essentials*, these documents are the primary strategy resources for teachers in the ASD Nest program. Many of the strategies in these documents are also supportive of other students in Nest classes, whether diagnosed with another special need, or a general education student.

Middle and high school teachers in the ASD Nest program have worked to compile this document, the **A5**. In it you will find a well-organized collection of strategies—including concrete examples—that consider students' underlying challenges and support students using areas of strength.

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Common Strengths of Students with ASD

Students on the autism spectrum do often face challenges in social and academic aspects of the school day. However, they also possess strengths that can support these difficulties. Only a partial list, the strengths listed below can be incorporated into supports and strategies teachers create for students. Note that these are not universal; as with any student, teachers must get to know individual children to best know how to support them.

Visual Thinking

Students on the autism spectrum are often visual thinkers. Incorporating icons, symbols, written directions, and other visuals can help students access content.

> *Sometimes I need more "eyes on" type of learning.*
>
> – 6th grade Nest student

Structures & Routines

Students with ASD are often comforted by predictability. It benefits students to use consistent classroom routines, as well as clear charts and visuals.

> *When you know what's coming you can be ready to act accordingly.*
>
> – 7th grade Nest student

Detail-oriented

When reading informational text, analyzing photographs, or engaging in discussion, students with ASD often pick up on details in information. Note that students may struggle to see the "big picture" which should be explicitly supported.

> *The forest for the trees? Sometimes I can see the veins on the leaves of the trees.*
>
> – adult with Asperger's

Reading

Though they may struggle with aspects of comprehension, many students on the autism spectrum have advanced decoding skills. Some have an interest and affinity for unique vocabulary.

> *I had picked up a copy of 'A Midsummer Night's Dream.' I opened the book and began to read it fluently. How weird is that?*
>
> – Like Jackson, 'Freaks, Geeks and Asperger Syndrome'

Math

Many students with ASD are quite proficient with computers and other technology. Allowing students to use computers, iPads, or other technology in the classroom or for homework can help with motivation as well as offer a better way for students to demonstrate their understanding.

> *We get a real kick out of numbers, us people with autism. Numbers are fixed, unchanging things. The number 1, for example, is only ever, ever the number 1. That simplicity, that clearness, it's so comforting to us.*
>
> – Naoki Higashida, 'The Reason I Jump'

Computers & Technology

Many students with ASD are quite proficient with computers and other technology. Allowing students to use computers, iPads, or other technology in the classroom or for homework can help with motivation and offer a better way for students to demonstrate their understanding.

> *With a laptop it is easier for me to review my work and it is neater when I make corrections.*
>
> – 6th grade Nest student

Logic

Students on the autism spectrum often show a preference for logic and reason. Showing how some content is rule-bound can play into their learning style.

> *I finally understood why so many people allow emotions to distort the facts. My mind can always separate the two. Even when I am very upset, I keep reviewing the facts over and over until I can come to a logical conclusion.*
>
> – Temple Grandin, 'Thinking in Pictures'

Special Interests

Students with ASD often have an area of special interest. These special interest areas or "passions" range from common cartoon or movie characters to particular animals or historical time periods to train schedules. By identifying, understanding, and incorporating a student's passion, teachers can increase motivation, make content more accessible, and help students feel understood and included.

> *I wish that other people… knew that whenever I'm around horses, I don't think about anything else. Like if I was stressed about one thing, and I went to see a horse or get on a horse, that thing I was stressed about, I wouldn't be stressed about anymore.*
>
> – Sarah, child with Asperger's (Messier et al, 2007)

For more information on incorporating special interests, see:

Lanou, A., Hough, L., & Powell, E. (2012). Case studies on using strengths and interests to address the needs of students with autism spectrum disorders. *Intervention in School and Clinic*, 47(3), 175-182. Available at http://steinhardt.nyu.edu/asdnest/professionals/publications

Common Challenges of Students with ASD

Behind the observable academic difficulties a Nest student may demonstrate is often one or more core challenges that are characteristic of individuals with ASD. Below are some of the common underlying challenges that students on the autism spectrum face.

CENTRAL COHERENCE

seeing the "big picture"

appraising the relative importance of details and the main idea

understanding the relevance of character traits, keeping in mind how a small part of a project connects to the completed end product

EXECUTIVE FUNCTIONING

employing multiple cognitive actions to work towards a goal

includes planning, organizing, prioritizing, time management

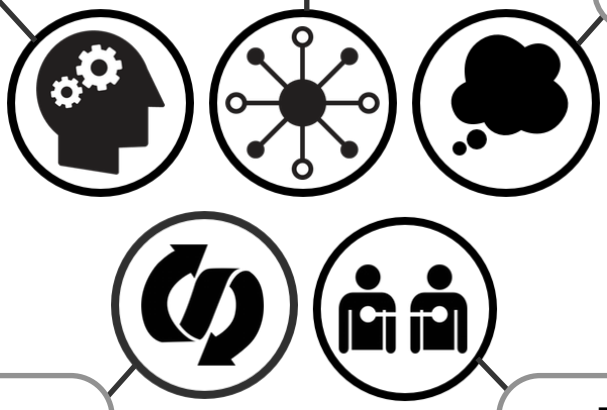
keeping an organized binder, planning out time to work on a long-term project

THEORY OF MIND

perspective taking; evaluating the thoughts, feelings, and motivations of others

involves self-awareness: an understanding of your emotions and actions and how they impact yourself and others

making reasonable guesses about character motivation, determining why a historical acted as s/he did



COGNITIVE FLEXIBILITY

thinking in new and unexpected ways, and breaking of routines when necessary

considering multiple ways to respond to a problem, and shifting gears to formulate best-fit solutions to problems

using multiple methods to solve a math problem, correcting the mistakes of another student's work

EXPERIENCE SHARING

connecting with others over: shared experiences, memories, emotional reactions, intended actions, ideas

includes episodic memory: personal representational memory anchored by the emotional connection

participating as others do in class activities, recalling personal memories or emotions (such as "a time I was proud of myself")

NOTE: This does not cover all potential challenges for students with ASD. Others include *sensory sensitivities, self-regulation, social-emotional needs, etc*. However, the focus of this document is on underlying challenges that can impede learning of subject-specific skills & content, not broader classroom functioning. For more information about general classroom supports, see the **Expanded Nest Essentials**, which includes supports for group work, classroom routines, self-regulation, and more.

Partially adapted from the work of S Gutstein

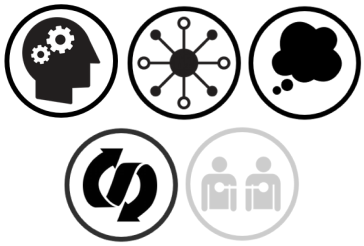
MATHEMATICS

Areas of Potential Challenge
1. Problem Solving
Including: a) *breaking down multi-step problems*, b) *word problems*, c) *choosing a strategy*, and d) *checking work using alternate methods*
2. Showing and Explaining Work
Including: a) *showing work* and b) *explaining mathematical thinking*
3. Discussing and Evaluating Work
Including: *giving and receiving feedback*
4. Content-Specific Challenge Areas
Including: a) *estimation and number sense* and b) *spatial organization*
5. Dealing with Frustration in Math
Including: a) *coping with not being "right,"* b) *accepting math when it doesn't appear immediately relevant*, and c) *developing independence*

Common Core State Standards – Standards for Mathematical Practice
Potential Strengths and Potential Challenges

CCCSS – Standards for Mathematical Practice	Potential Strengths	Potential Challenges
Make sense of problems and persevere in solving them	✓ Determination	• Cognitive flexibility • Central coherence • Executive functioning
Reason abstractly and quantitatively	✓ Quantitative reasoning	• Central coherence
Construct viable arguments and critique the reasoning of others	✓ Rule orientation: using logic and developing an argument	• Cognitive flexibility • Theory of mind • Experience sharing
Model with mathematics	✓ Visual orientation	• Central coherence • Cognitive flexibility • Executive functioning
Use appropriate tools strategically	✓ Technological skills	• Cognitive flexibility • Flexible thinking • Sensory integration
Attend to precision	✓ Detail orientation ✓ Computation skills	• Central coherence
Look for and make use of structure	✓ Pattern recognition ✓ Procedural abilities	
Look for and express regularity in repeated reasoning	✓ Pattern recognition	• Episodic memory

Due to challenges in: **Students on the spectrum may struggle with:**



Problem Solving

CCSS MPS1

Problem Solving: Breaking down multi-step problems

General Suggestions:

- ✓ Focus extra attention on analyzing what the problem is asking
- ✓ Discuss and post a variety of problem solving strategies
- ✓ Provide checklists and graphic organizers as support for breaking down problem solving into manageable steps

Additional Strategies:

Provide a checklist with problem-solving completion steps:

> Problem-Solving Checklist:
>
> - ✓ Did I show my work for all the parts of the problem and showed the operations I used?
> - ✓ Did I write my answer in the correct space, including a unit?
> - ✓ Did I write an explanation of my mathematical thinking to explain how I solved the problem step-by-step?

Task Analysis: Break down the parts of a multi-step task

> **How Perfect Is My Graph?**
>
> - ❑ Do I have an x-axis and a y-axis?
> - ❑ Are my x and y-axes labeled "X" and "Y"?
> - ❑ Are my x and y-axes numbered correctly, with an appropriate scale?
> - ❑ Is each of my points plotted in the form (x, y)?

Groetzinger

Problem Solving: Word problems

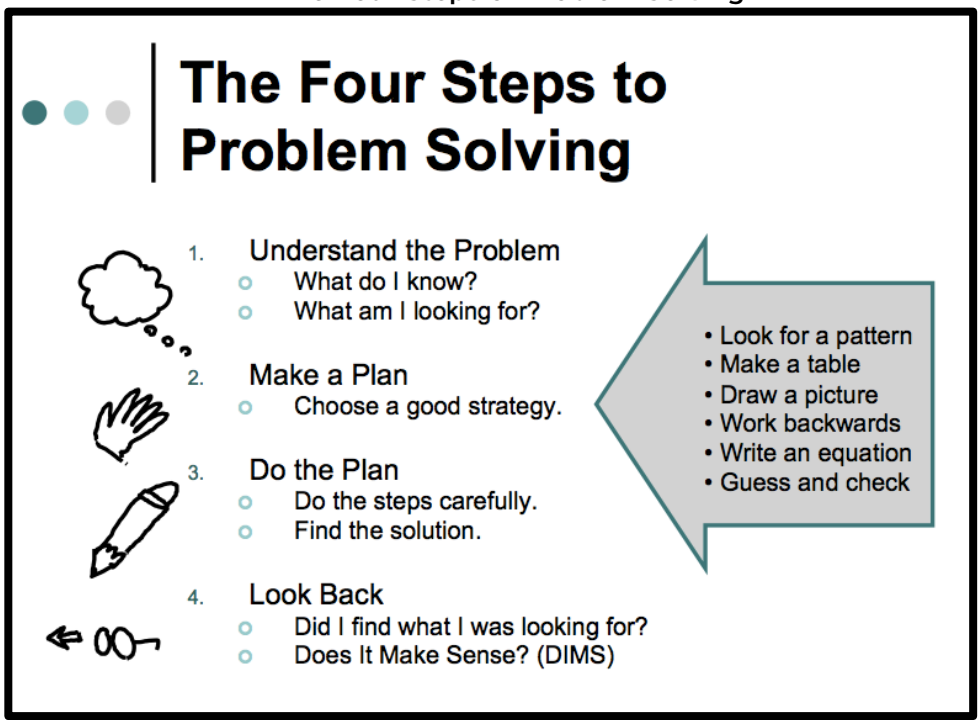
General Suggestions:

- ✓ Focus extra attention on analyzing what the problem is asking
- ✓ Teach students how to consider word problems carefully, not just focusing on the solution
- ✓ Support students' understanding of the perspective offered in the word problem, as opposed to their own reaction or point of view of the problem
- ✓ Practice role-playing, sketching, envisioning the "world" of the problem

Additional Strategies:

Post, discuss and refer back to problem solving steps

The Four Steps of Problem Solving



Lanou, from Polya

Provide a template with consistent problem-solving steps

Problem Solving Helper (see following pages)

This graphic organizer lays out the steps of problem solving in order to activate students thinking carefully about each step. More time can be devoted to a given "box" of the organizer depending on identified areas of challenge for a specific student or class. Furthermore the organizer holds students accountable for documenting their thinking process.

Name: _____ Section: _____ Date: _____

<table>
<tr><td rowspan="2">ANALYZE THE PROBLEM</td><td>Explain <u>in your own words</u> what this problem asks you to do or find:
_____
_____
_____
_____
_____
_____
_____</td><td>List all relevant given information:
_____
_____
_____
_____
_____
_____
_____</td></tr>
<tr><td colspan="2">What relevant prior knowledge (definitions, properties, theorems, equations, formulas, etc.) will allow you to solve this problem?
Explain or define each concept you provide:
_____
_____
_____
_____
_____
_____
_____
_____
_____</td></tr>
<tr><td>MAKE A PLAN</td><td>Make a plan
• List <u>each step</u> you will take to solve this problem
• Specify what problem solving strategy/ies you will use
_____
_____
_____
_____
_____
_____
_____
_____
_____</td><td>Problem Solving Strategies Bank:
• Draw a picture
• Make a table
• Look for a pattern
• Write an equation
• Work backwards
• Guess and check</td></tr>
</table>

Adapted by Groetzinger from Lanou 2012, Based on Polya 1945

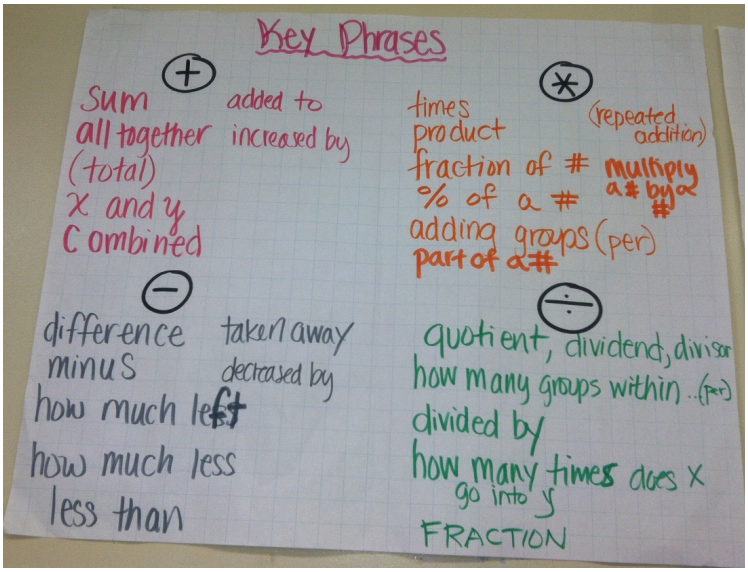
DO THE PLAN	EXPLAIN AND EVALUATE SOLUTION
Show ALL your work in the space below. Label everything. If you change course, explain why you did so: **Check your work:**	**A. Justify your solution:** 1) Does your answer make sense? Explain why or why not: 2) What theorems, definitions, equations, formulas or mathematical properties justify your solution? Explain:

Adapted by Groetzinger from Lanou 2012, Based on Polya 1945

Develop a chart of keys words that indicate various operations with students—but promote cognitive flexibility ("of" does not *always* indicate multiplication)

Key Phrases Chart

This chart helps students use key words and phrases to identify specific operations that might be required in the problem.



Houston

Key Words Graphic Organizer

This document allows students to create their own chart of key words and phrases as they investigate a variety of word problems.

Name: _____ Date: _____

Math "Key" Words

OPERATION	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	
NOTATION					
KEY WORDS					"The quantity"

Groetzinger

Annotate word problems in order to pull out main ideas

How to Annotate a Word Problem

This document utilizes annotation strategies used in other core content areas (e.g. ELA, Social Studies) and applies it to math. It provides strategies and codes for annotating a word problem.

How to Annotate a Word Problem

Annotating allows the mathematician to analyze the problem and is a tool to get a deep understanding. Any word problem should be read at least twice to ensure the mathematician learned as much as possible from the problem.

Read the problem the first time and annotate for Understanding:

- *Underline key words*
- *Circle important information*
- *Summarize in chunks what you do understand (What information are you given? What are you asked to find?)*
- *Paraphrase a sentence you are struggling with.*
- *Identify prior knowledge that will help you understand the problem and write it down.*

Read the problem again for a Deeper Understanding by doing some analysis:

- *Make connections to other problems you've seen*
- *Make Predictions about the solution (magnitude, units)*
- *Identify procedures and strategies you can use to solve the problem*
- *Write down a plan*

How to Annotate a Text

Right Margin: Paraphrase and summarize.
Left Margin: Write your relevant prior knowledge and plan your solution pathway.
C = Connection
? = Question
Underline = Key words
Circle – Important information

Groetzinger / Houston, adapted from MBHS

Problem Solving: Choosing a strategy

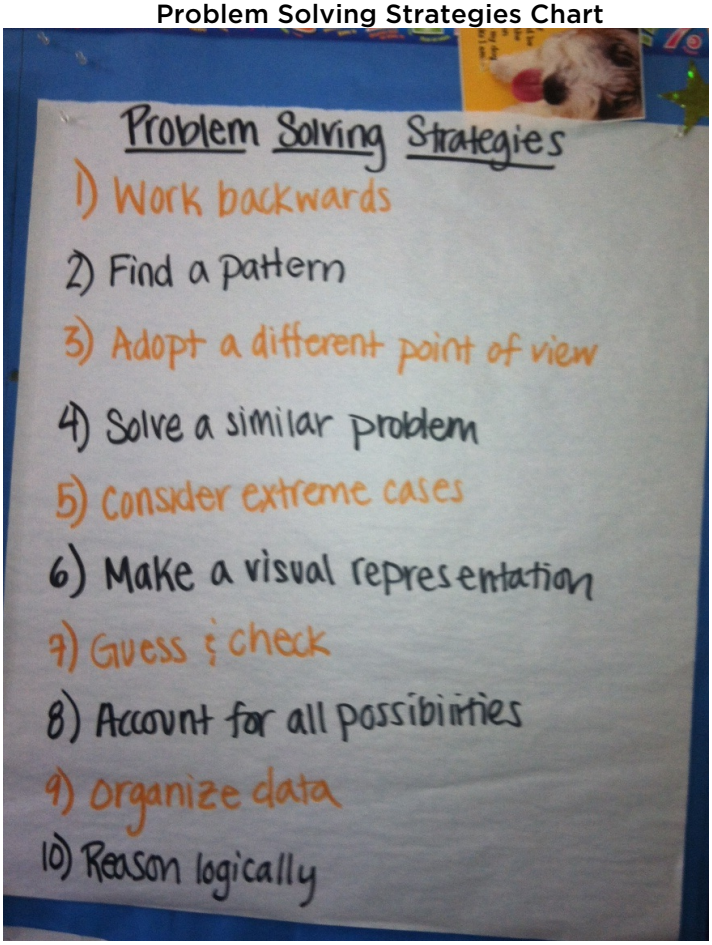
General Suggestions:

- ✓ Discuss and chart multiple problem-solving strategies
- ✓ Focus extra attention on the idea that the same problem could be solved by using a variety of different strategies
- ✓ Support students' understanding of different perspectives/approaches to solving problems
- ✓ Focus extra attention on the value in seeing multiple strategies (as used by classmates) for checking work

Additional Strategies:

Chart problem solving strategies

Problem Solving Strategies Chart



Problem Solving: checking work

General Suggestions:

- ✓ Focus extra attention on how to show work, check work
- ✓ Focus extra attention on emphasizing expectation of showing/defending rationale
- ✓ Think about challenging of reflecting/dissecting mathematical thinking
- ✓ Think aloud challenges of showing and checking work
- ✓ Show model examples of how shown/checked work should look
- ✓ Show work examples of work not shown/checked and have students revise it

Additional Strategies:

Write a Social Story™ to explain social reasons for its importance

Why We Check Work…

- ❖ Checking work is just like editing and revising in ELA. It helps us make sure we are handing in our BEST possible work!
- ❖ EVERYONE makes mistakes (even teachers), and that's okay! It's important to be able to go back and revise these mistakes. That's what checking work does.
- ❖ You can lose points on tests/quizzes/projects/ notes because of silly calculation errors. Don't let that happen--re-calculate your answers. DON'T BE A CALCULATOR HATER!

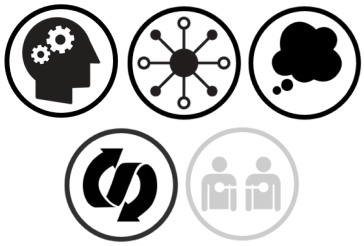
Houston

Break down (task analyze) how to show and check work; provide a rubric

Rubric for WORK TIME

4 (100%)	Students: o Keep conversation on topic and limited to math. o Help each other by explaining strategies. o Make every effort to complete as much work as possible.
3 (75%)	Students: o Maintain focus most of the time. o Help each other verify correct answers (but did not share strategies or processes.) o Complete most of their work.
2 (50%)	Students: o Are frequently off task. o Show limited effort in helping one another and sharing strategies. o Complete minimal work.
1 (25%)	Students: o Are disruptive to group and/or entire class. o Complete little to no work.

Due to challenges in:



Students on the spectrum may struggle with:

Showing and Explaining Work

CCSS MPS 3

General Suggestions:

- ✓ Focus extra attention on emphasizing expectation of showing/defending rationale. Discuss rationale for why it's important—explain why it's a mathematical rule. Include explaining thinking as an expectation on a problem-solving checklist
- ✓ Provide students with mathematical language to explain their thinking
- ✓ Support students' understanding of different perspective/approaches to solving problems
- ✓ Think-aloud challenges of explaining thought process
- ✓ Use social thinking language to build awareness of different approaches to problem-solving ("Your thoughts are different than my thoughts, so it's important to explain my work so that you understand how I solved the problem.")
- ✓ Show model examples of how explained work should look, and examples of work not sufficiently explained to have students revise it

Additional Strategies:

Break down (task analyze) how to explain work. Use sentence starters, retell parts of process in sequence "First, I noticed…Then…After that," etc.

CLOZE ACTIVITIES

I knew _____, and
the numbers the problem says

I needed to know _____,
what you're looking for

so I _____
the operation or strategy you used

and found _____.
your answer

Lanou 2010

Provide and teach into rubrics to establish clear expectations for showing/explaining work

Math Problem Solving Rubric

This rubric lays out clear expectations for mathematical problem solving, divided into three components:

1) Showing math knowledge
2) Using problem solving strategies
3) Writing an explanation

Math Problem-Solving Rubric			
Your score	**SHOWING MATH KNOWLEDGE (Can you do the problem correctly?)**	**USING PROBLEM-SOLVING STRATEGIES (How do you solve the problem?)**	**WRITING AN EXPLANATION (Can you explain your work?)**
5	• I figure out the **correct answer**. • I solve the problem with **no mistakes**.	• I use **all the important information** from the problem. • I show **all the steps** I used to solve the problem. • I make **a drawing** to show how I solved the problem	• I write **what** I did **and why** I did it. • I explain **each step** of my work. • I use **math words and strategy names**. • I write the **answer in a complete sentence** at the end of my explanation.
4	• I figure out the **correct answer**. • I solve the problem, but I make **a few small mistakes**.	• I use **most of the important information** from the problem. • I show **most of the steps** I used to solve the problem.	• I write **what** I did **and** a little about **why** I did it. • I explain **most** of my work.
3	• I figure out **part of the answer**. • I try to solve the problem, but I make **some big mistakes**.	• I use **some of the important information** from the problem. • I show **some of the steps** I used to solve the problem.	• I write a little about **what** I did **or why** I did it, but not both. • I explain **some** of my work.
2	• I try to solve the problem, but I **don't understand** it.	• I use **very little important information** from the problem. • I show **almost none of the steps** I used to solve the problem.	• I write something that **doesn't make sense**. • I write an **unclear answer.**
1	• I **don't try** to solve the problem.	• I show **no steps** that I used to solve the problem.	• I **don't write anything** to explain how I solved the problem.

Parker, R. & Breyfogle, M. L. (2011). Learning to write about mathematics. *Teaching Children Mathematics*, 18(2), 90-99.

Open Response Rubric

This rubric lays out clear expectations for student responses to math open response questions including: work shown, all parts of question answered, correct solution, use and explanation of appropriate operations, and clear explanation of work.

Category	3	2	1	0
WORK SHOWN	Shows all work	Shows some work	Shows a little work	Shows no work
ALL PARTS	Answered all parts of the question	Answered some parts of the question	Answered one part of the question	Did not answer the question
SOLUTION	Solution is correct	Solution is partially correct, but work is shown	Solution is partly correct with a little work shown	Solution is not correct and no work is shown
OPERATION	Used and explained correct operation	Used correct operation, but did not explain	Did not use correct operation but showed some work	Did not use correct operation and showed no work
CLEAR WORDS	Explanation of answer is clear and in words	Explanation of answer is some what clear in words	Explanation of answer is not really clear but is in words	Explanation of answer is not included

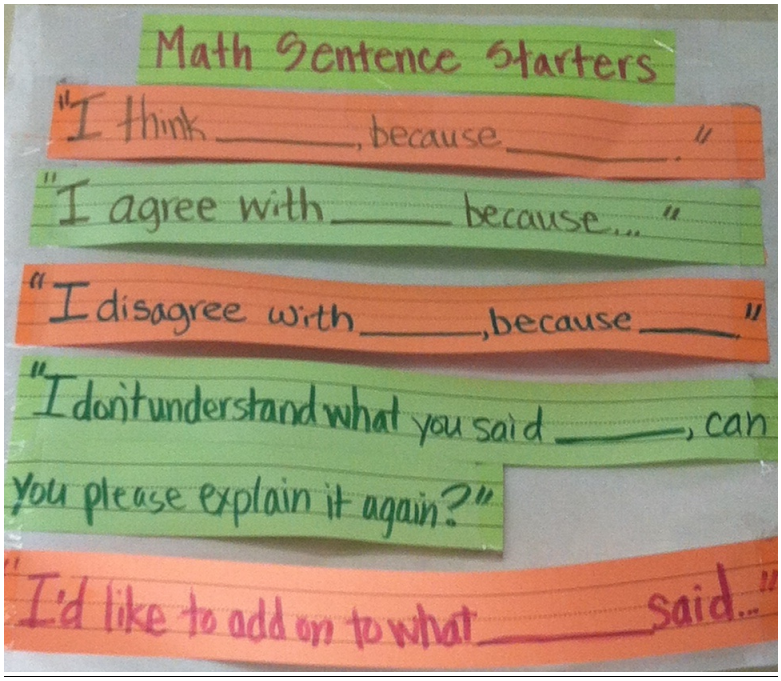
Provide a Social Story™ for the importance of showing work

Why We Show Work…

- We can only get full credit on assignments if we show ALL work.
- Showing work shows our thought process. It's important for OUR TEACHERS and US to understand our thought processes in math in order to see where our mistakes might be.
- Math is a universal language. In order to communicate our work, we must show our work. In order for everyone to understand what we say, we speak in full sentences; in order for everyone to understand what we're trying to say in math, we show our work. We wouldn't stop speaking mid-sentence!

Houston

Provide students with mathematical language to explain thinking



Use a template for breaking down a problem that includes space to show and explain work (see following pages)

Name: Class:

Scholar's Challenge: _____

I. RESTATE THE PROBLEM

This Scholar's Challenge is about:

_____

_____

_____

II. PROCESS & EVIDENCE

Step 1: To start this problem I first:

_____

_____

The reason I used this process was because:

_____

_____

This is Step 1: (Show your work)

Step 2: The second step I performed was:

_____

_____

The reason I used this process was because:

_____

_____

This is Step 2: (Show your work)

Step 3: The third step I performed was:

_____

_____

The reason I used this process was because:

_____

_____

This is Step 3: (Show your work)

Step 4: The fourth step I performed was:

_____

_____

The reason I used this process was because:

_____

_____

This is Step 4: (Show your work)

III. SOLUTION IN A COMPLETE SENTENCE

The solution to this problem is:

_____

_____

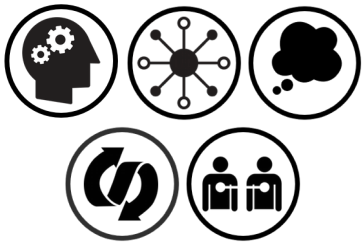
Two interesting or important observations I have about this problem are:

_____

_____

_____

Due to challenges in:



Students on the spectrum may struggle with:

Discussing & evaluating work:
Providing and accepting peer feedback

CCSS MPS 3

General Suggestions:

- ✓ Prime students for receiving feedback from their peers, and the possibility of having to make changes
- ✓ Prime students for providing feedback: what is helpful, and not helpful, suggestions to give

Additional Strategies:

Use language highlighting social concepts from SDI

*Remember to **think about your partner's thoughts**—why might he or she be making a suggestion?*

*Your partner might have solved the problem differently than you. But we can all be **flexible** and listen to their process.*

Use templates that structure providing peer feedback

PARTNER 1	**PARTNER 2**
1) Positive observation *I liked how you…* *You did ____ well.*	1) Positive observation *I liked how you…* *You did ____ well.*
2) Constructive feedback *I think it would help if you…* *You might want to think about trying…* *Can I show you a part that I think might have been confusing?*	2) Constructive feedback *I think it would help if you…* *You might want to think about trying…* *Can I show you a part that I think might have been confusing?*
3) Encouragement *Nice job with the…* *Keep up…*	3) Encouragement *Nice job with the…* *Keep up the…*

Lanou

Collective group work tracking sheet

How did your group complete the Construction? Even if you were unable to arrive at the final correct solution, what process did you follow?

Group members:	Each member's Ideas:

I shared twice ○

Each member shared twice ○

I actively listened ○

I documented our ideas ○

Groetzinger / Michaelson

Due to challenges in:

Students on the spectrum may struggle with:

Specific mathematical content, including:

- Number sense (manipulating numbers with conceptual understanding of what they represent)
- Spatial organization

CCSS NS, RP

Number Sense: Estimation, place value, fractions/decimals/percents

General Suggestions:

- ✓ Make connections to everyday life in order to highlight the purpose of numbers
- ✓ Make numbers concrete using visual/physical representations
- ✓ Connect new skills to previous skills being taught in order to show how math concepts build on one another
- ✓ Use graphic organizers to support detail management during multi-step calculations
- ✓ Role play word problems/math scenarios in order to make numbers concrete

Additional Strategies:

Use place value charts as templates until no longer needed

hundreds	**tens**	**ones**		***tenths***	***hundredths***	***thousandths***
			●			

Lanou

Estimation Challenge: conduct an activity exposing student to why and when people estimate

Directions: With your group, estimate the measurement of the following items. Do not use any rulers, tape measures or timers.

Item	Estimated Measurement
Height of Math Center	
Width of 1 closet door	
Length of the number line from -10 to 42	
Area of 1 Window Pane	
Amount of time it takes to say your ABC's	
Amount of time it takes to write your ABC's	
Amount of time it takes Ms. Powell to walk home	

Which item would be more of a guess than an estimate? Why?_____

_____

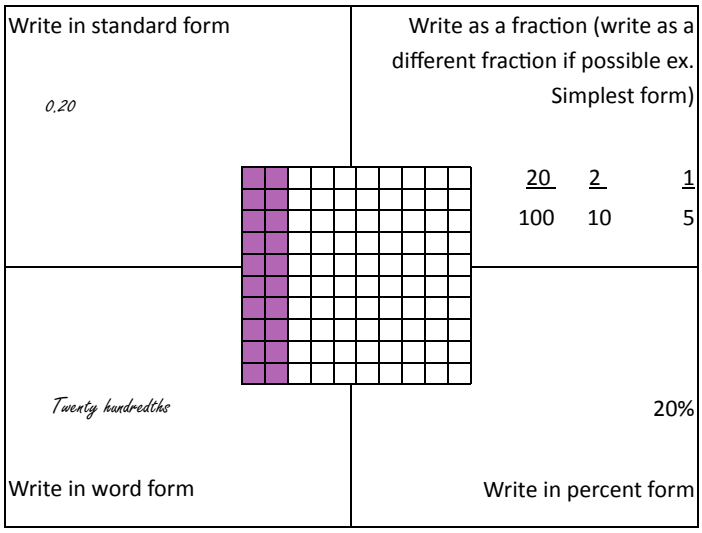
How is a guess different than an estimate?_____

Powell

Use manipulatives/visuals/videos in order to explain the reasoning behind mathematical rules and make numbers concrete

Fraction/Decimal/Percent Organizer

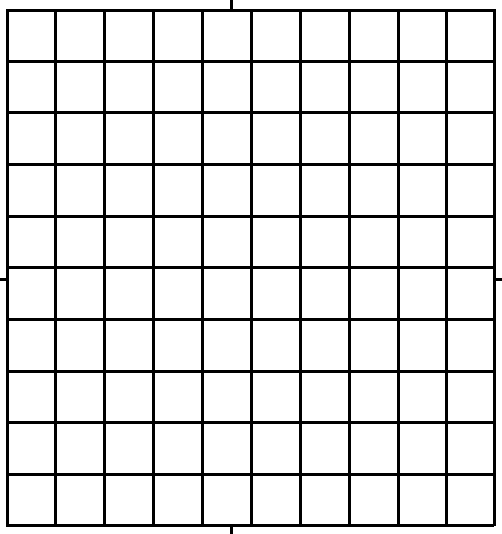
Used to have students model decimals, show as a fraction, write in word form and percent
Use as a formative assessment: give each student a different number to complete the organizer)
Use as a cooperative leaning activity: use dice, work with partner to make largest decimal, etc.
(see blank full-page organizer on next page)



Groetzinger

Write as a fraction (write as a different fraction if possible ex. Simplest form)

Write in percent form



Write in standard form

Write in word form

Groetzinger

Spatial Organization

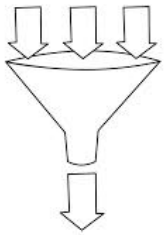
General Suggestions:

- ✓ Provide graph paper
- ✓ Provide clearly outlined boxes for keeping work appropriately lined up in multi-step problems
- ✓ Highlight the lines that students should use (and not use)

Additional Strategies:

Use a visual and teach into "funneling" multi-step problems

"Funneling" Multi-Step Problems



Example:

$3x^2 - 2y + 6x + 5x^2 - 5y - x$

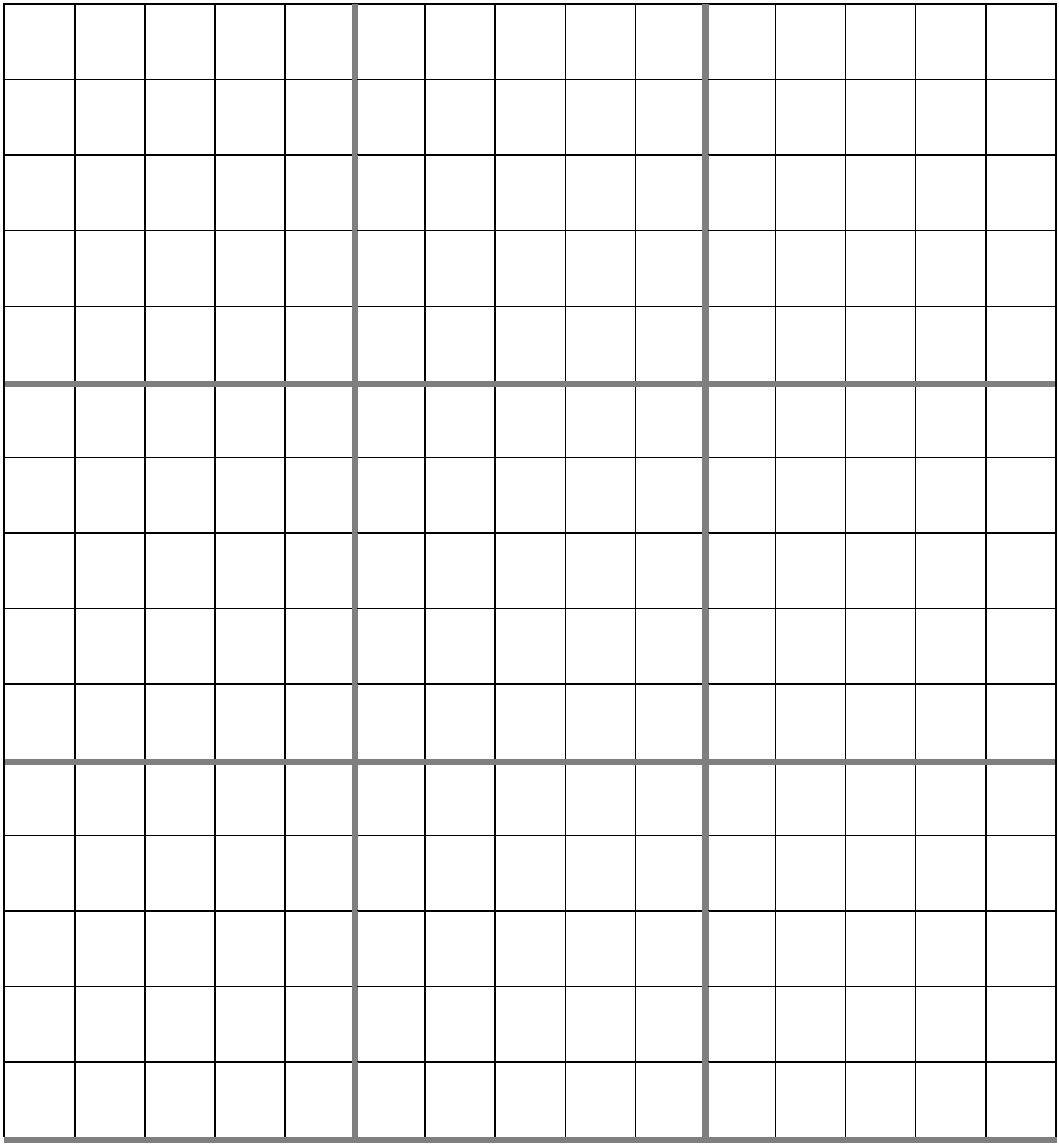
$8x^2 - 2y + 6x - 5y - x$

$8x^2 - 7y + 6x - x$

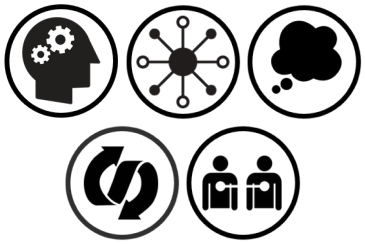
$8x^2 - 7y + 5x$

Provide 1/2-inch grid to align work, writing one numeral in each square
(full sheet on next page)

	5	5	.	2										
x	1	.	2	0										



Due to challenges in: **Students on the spectrum may struggle with:**



Dealing with frustration in math

Coping with not being right

General Suggestions:

For students who become anxious about not being right:

- ✓ Put emphasis on arriving at answer—not on being right
- ✓ Model not being right, and accepting not being right
- ✓ Focus attention on the fact that there is a range of problems (problem scale) and that not being right might be a low-level problem
- ✓ Break down (task analyze) what to do when you're feeling overwhelmed because you're not right in math
- ✓ Write Social Stories™/ articles about how everyone makes mistakes and why it's ok
- ✓ Use social language from SDI to support an understanding of not being right ("everyone makes mistakes," "big problem/little problem")

For students who struggle to acknowledge that they are not right:

- ✓ Model not being right—and accepting not being right
- ✓ Write Social Stories™/articles about how everyone makes mistakes and why it's ok
- ✓ Focus attention on the fact that there is a range of problems (problem scale), and that not being right might be a low-level problem
- ✓ Develop a classroom culture in which all students revise their work and understanding that strong mathematicians check over their answers in order to look for errors
- ✓ Develop a classroom culture in which students are accustomed to checking their work with various sources (charts, handbooks, notes, etc.)

Additional Strategies:

Classroom Chart

What to Do When You're Not Right?

- Take a deeeeeeep breath
- ✓ Take a break
- ✓ Think about this problem in the grand scheme of things
- ✓ Realize everyone makes mistakes, and it's no big whoop!

Accepting math concepts when they don't seem relevant

General Suggestions:

- ✓ Focus extra attention on explaining how mathematical concept concepts are applicable to every-day student life
- ✓ Focus attention on acceptance of things that may not seem immediately useful to us
- ✓ Complete word problems relating to adolescent life
- ✓ Think-aloud and model accepting something that may not seem immediately useful (like completion of a Field Test)

Additional Strategies:

Write and read Social Stories™/articles about why math is important to everyday life

Why Do I Have to Know This Stuff?

Sometimes we have to learn things that don't seem to have a point. This often happens in math. We have to learn formulas and properties that we don't see as useful in our every day lives.

Many professions use math all the time! Engineers, designers, and architects must use math every day.

There are some concepts in math that we use all the time. We use mental math to calculate things in our heads. We use fractions in order to divide things up. We use percents in order to calculate tips at restaurants.

There are some concepts in math that we don't use all the time. For example, we most likely don't have to use number properties or the real number system in our every day lives. But, it is still important that we know them, because concepts like these teach us how to solve problems and think logically. Can you imagine what the world would be like if no one knew how to solve problems?

6th grade math is also important because it prepares us for 7th grade math, which, in turn, prepares us for 8th grade math, and then 9th grade math, and so on… If we don't learn 6th grade math, we may not move on to high school or college math.

There are some things that we just have to accept in life. We have to accept responsibilities as adults that may not seem useful. Our bosses ask us to do things that may not seem immediately useful, but we know that we have to do them in order to excel at our job. The same thing is true with middle school. Our teachers ask us to do things that may not seem immediately useful, but we have to do them in order to excel at our school work.

If I am feeling like a concept is not useful, I can try to:

…ask my teachers ONCE why it may be useful
…accept that I need to learn the concept in order to do well
…ask for clarification about a concept or for harder work

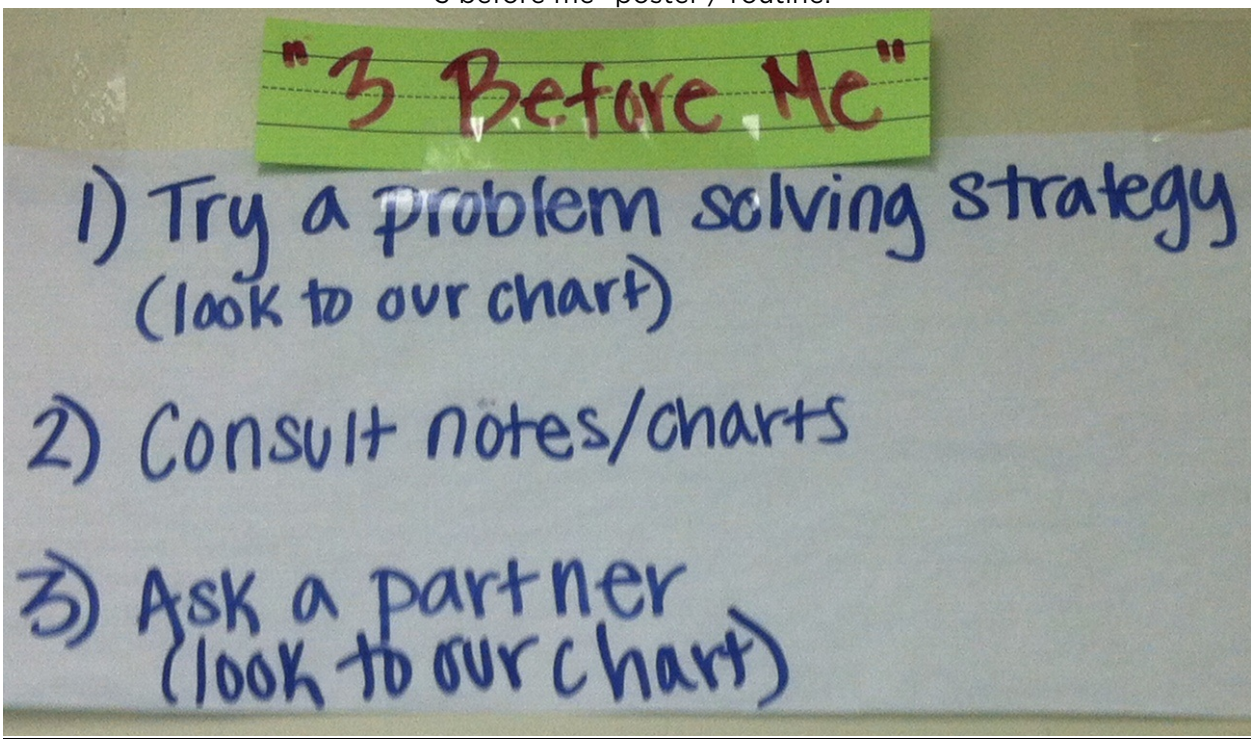
Developing independence

General Suggestions:

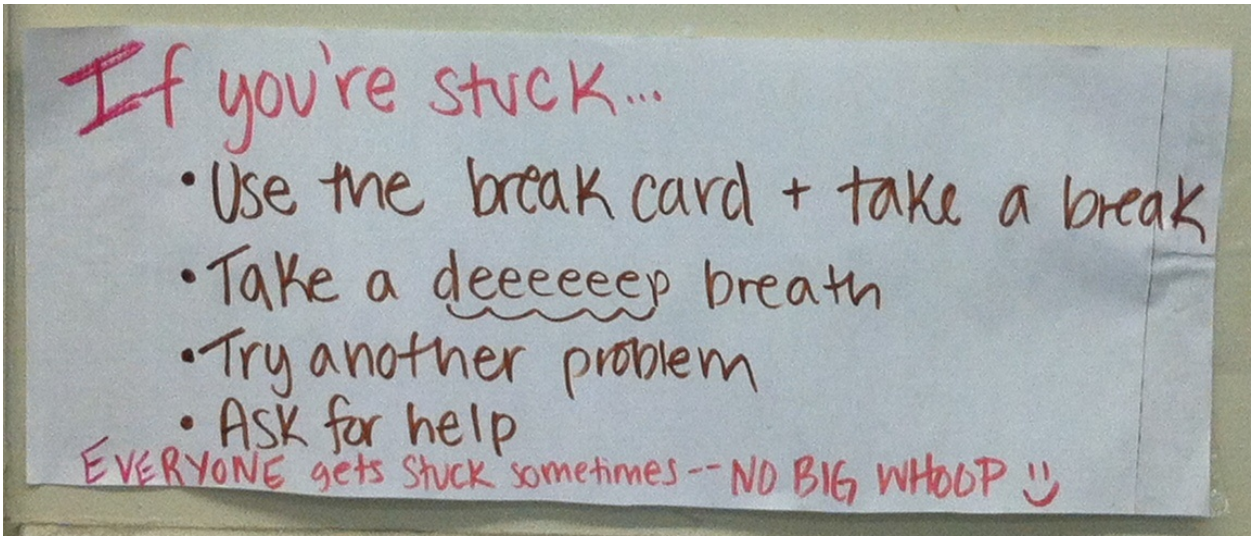
- ✓ Post steps of problem solving prominently in the classroom
- ✓ Create classroom routines that encourage student to problem solve independently (*see "Three before me" and "If you're stuck" posters below*)

Additional Strategies:

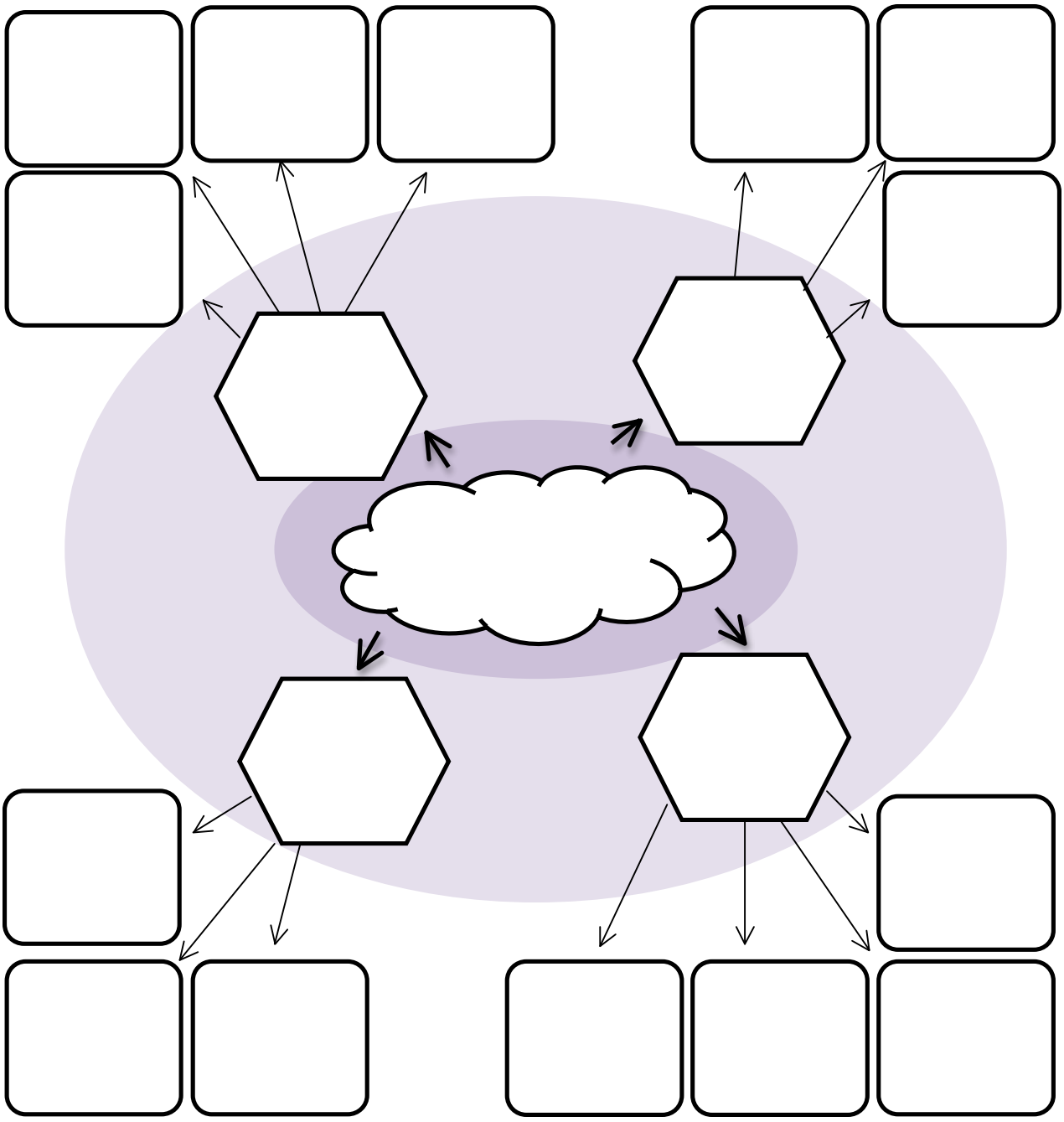
"3 before me" poster / routine:



"If you're stuck" poster:



Unit vocabulary web: have students track vocabulary and form connections over a unit



Prior Knowledge

Circle
Radius
Diameter
Perpendicular
Pythagorean theorem
Proofs
Vertical angles

WORD BANK

Simplifying radicals
Congruence
Proportions
Bisectors
Graphing in the coordinate plane
Right angles
Angle addition
Chord
Arc
Arc measure
Arc length
Arc addition
postulate
Central angle

New Knowledge

Equation of a circle
Graphing circles
Tangent
Tangent line theorem
Secant
Inscribed angle

Groetzinger/Michaelson/Lanou

Encourage self-reflection & metacognition with end-of-lesson reflection or exit tickets

Lesson #	Lesson objective:

Today we learned:	Example:

Provide scaffolded unit reviews to encourage independent study habits

Name: _____ Date: _____

Math Pre-Assessment
Unit ___

Directions: Review each concept below. If you feel that you understand the concept, check **YES** and then answer the sample question in the next box. If you feel that you don't quite understand the concept fully, check **NO** and then circle which study method you think will help you the best.

CONCEPT and SAMPLE QUESTIONS	DO I UNDERSTAND THE CONCEPT?	
	☐ **YES** I can answer these questions easily: →	
	☐ **NO** I'll do this to help me learn: →	review problems in my Math Journal review concepts in my Reference Book ask a friend/family member: _____ other: _____ _____
	☐ **YES** I can answer these questions easily: →	
	☐ **NO** I'll do this to help me learn: →	review problems in my Math Journal review concepts in my Reference Book ask a friend/family member: _____ other: _____ _____

Lanou

GUIDED NOTES

If requiring students to take notes, it may be useful to use **GUIDED NOTES**, a visual note-taking support. They provide structure to a note-taking sheet, as well as reduce the amount of writing required. There is research to support that the use of guided notes makes students' notes more organized, allows them to focus more on the content, and can improve performance on tests and quizzes.

For students in the Nest program, there are added benefits. With regular use of **GUIDED NOTES**, students can:
- engage more directly with the content, without being distracted by writing demands
- follow the flow of classroom activities, due to the predictability of the structure
- participate more in classroom discussions, with support of this visual, concrete aid

Creating GUIDED NOTES

Based on your mini-lesson outline, or PowerPoint/SMARTBoard lesson:
1. Create a copy of your outline (or copy & paste your PPT/SB presentation content into a Word document)
2. Substitute key words and phrases with blank lines (with sufficient space for students to hand-write the words)
   - *select words that are important for your students to write: main ideas, vocabulary, ideas to remember*
3. Incorporate symbols, visuals, and graphic organizers (see below)
4. Distribute the guided notes sheet before a lesson, and use the outline to follow the flow of the lesson

symbols	visuals	graphic organizers
use consistent symbols to indicate main ideas, key points, etc.	include diagrams, maps, and pictures for students to refer to and label	incorporate simple webs, cause and effect diagrams, and other organizers to reinforce connections between ideas

Sample Guided Notes Sheet: Science

The Layers of the Atmosphere

There are ☐ layers of the atmosphere. *

The _____ is the layer closest to the earth.
• where _____ & _____ live

The _____ is where the ozone layer is located.
• where _____ fly

The _____ is the coldest layer.
• where meteors _____

The _____ is where shuttles orbit the earth.
• where temperature is _____

The _____ is the layer farthest from the earth.
• where air is the _____

important qualities of layers of the atmosphere *

☐ ☐ ☐ ☐

* = key idea

____sphere
____sphere
____sphere
____sphere
____sphere
earth

Sample Guided Notes Sheet: Science *completed*

The Layers of the Atmosphere

There are **5** layers of the atmosphere.*

The **troposphere** is the layer closest to the earth.
• where plants an animals live

The **stratosphere** is where the ozone layer is located.
• where jets fly

The **mesosphere** is the coldest layer.
• where meteors burn up

The **thermosphere** is where shuttles orbit the earth.
• where temperature is highest

The **exosphere** is the layer farthest from the earth.
• where air is the thinnest

important qualities of layers of the atmosphere *

distance from earth | temperature | distance from earth | air quality

* = key idea

exosphere
thermosphere
mesosphere
stratosphere
troposphere
earth

Implementation

- Introduce guided notes to the entire class, so as not to stigmatize individual students
- Teach directly into taking notes using guided notes sheets – allow for practice
- Create and instruct students about a structure for organizing/tracking guided notes sheets (binders, folders)
- Instruct students how to use guided notes sheets as reference for homework, to review for quizzes, etc.

Other considerations

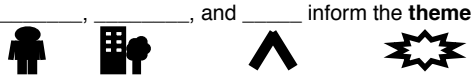
- Differentiate by varying the amount of writing required
- Include space designated for extra thoughts, reactions, questions
- Align with Depth of Knowledge levels (apply a concept, synthesize information from multiple sources)

Sample Guided Notes Sheet: ELA

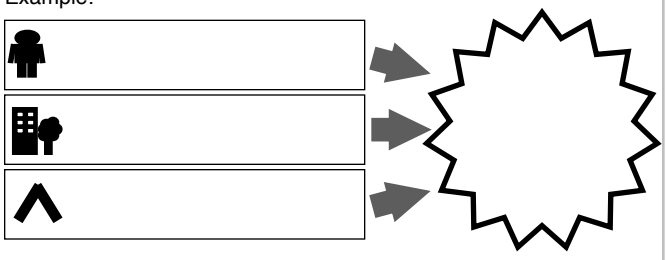
Connecting **Theme** to Story Elements

Theme is the _____ of a story
It can be stated in ____-__-____ words.
Examples: _____, _____, _____

_____, _____, and _____ inform the **theme**



Example:



Summary Sentence

The theme of the story _____ is _____.
The characters () _____.
The setting () _____.
The plot () _____.
This is all evidence show the theme () _____.

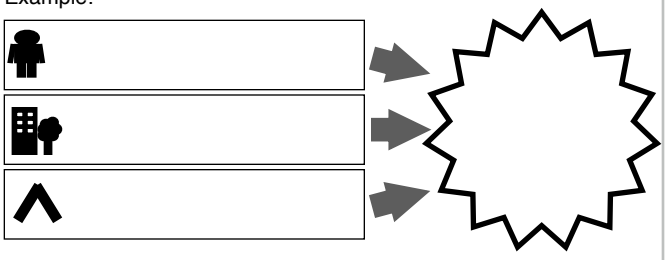
Sample Guided Notes Sheet: ELA *completed*

Connecting **Theme** to Story Elements

Theme is the subject of the message of a story
It can be stated in one-to-two words.
Examples: perseverance, growing up, overcoming obstacles

Characters, setting, and plot inform the **theme**

Example:



Summary Sentence

The theme of the story _____ is _____.
The characters () _____.
The setting () _____.
The plot () _____.
This is all evidence show the theme () _____.

Additional Resources

- **Guided Notes: Improving the Effectiveness of Your Lectures**: http://ada.osu.edu/resources/fastfacts/Guided-Notes-Fact-Sheet.pdf (or google ***guided notes fact sheet***)
- **Guided Notes: Increasing Student Engagement During Lecture and Assigned Readings** (Intervention Central): http://www.interventioncentral.org/academic-interventions/study-organization/guided-notes-increasing-student-engagement-during-lecture- (or google ***intervention central guided notes***)
- **Preparing Guided Notes: A guided system of learning within lecture** (Study Guides and Strategies): http://www.studygs.net/teaching/guidednotesa.htm (or google ***preparing guided notes***)

CORNELL NOTES

The **Cornell method** of note-taking provides a systematic format for writing concise, organized notes. Students divide their paper into two columns:

- the note-taking column on the right
- the questions/key word column on the left

They then leave five to seven lines—or about two inches—at the bottom of the page

Students write notes from a class (or a text book) in the note-taking column. Notes should consist of the important ideas and concepts from the text or lecture, and long ideas are paraphrased. Teachers teach students to avoid long sentences and to use symbols or abbreviations instead.

To assist with future reviews, relevant questions or key words are written in the key word column on the left, after the lecture or reading.

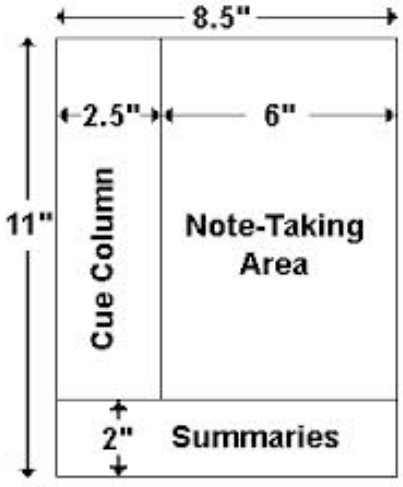
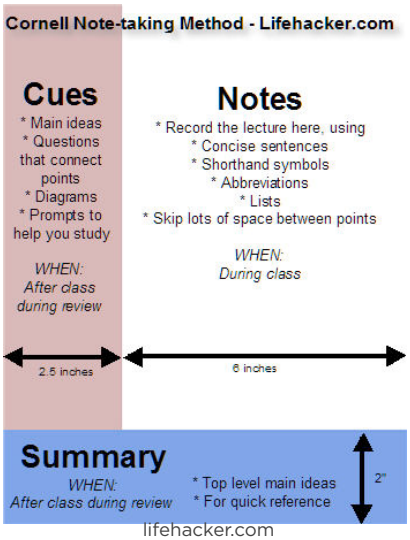
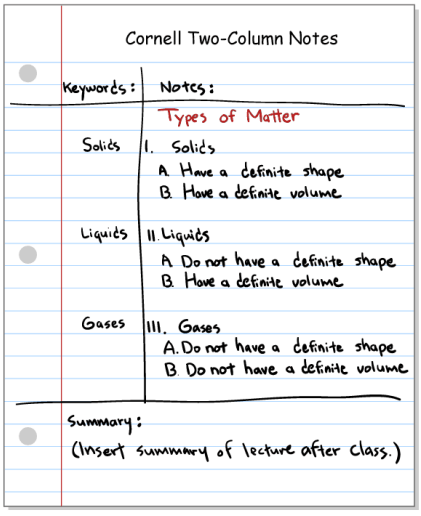
Within 24 hours of taking the notes, students review their notes and write main ideas and questions in the left column. Then, they write a brief summary in the bottom five to seven lines of the page. This helps to increase understanding of the topic. When studying for a test or quiz, students have a concise but detailed and relevant record of previous classes.

When reviewing the material, students can cover the note-taking (right) column while attempting to answer the questions/keywords in the key word or cue (left) column. Students are encouraged to reflect on the material and review the notes regularly.

Adapted from wikipedia.com

Examples

The images below show examples of how to set up Cornell Notes on a page, what each section is used for, and an example of what a completed notes sheet may look like.

Setting up Cornell Notes	Description of sections	Example
		
www.montgomerycollege.edu	lifehacker.com	fontanamiddleschool.wikispaces.com

Below is a larger example of a completed sheet of Cornell Notes, including how you may want to set up the heading for the page.

Topic: Cornell Notes

Subject: ELA **Date:** September 9, 2014

Main Ideas	Details
Uses for Cornell Notes	• Organized by main ideas and details • Can be used to provide an outline of the course, chapter, or lecture • Can be used to provide a "big picture" of the course, chapter, or lecture • Sequential: students take notes as they are given by the teacher or in a text book • At the end of class, students write a summary of what they learned to clarify and reinforce learning and to assist retention (or assign for homework)
Benefits of Cornell Notes	• Can be used as a study tool: students get a quick overview and determine whether they need more information or need to concentrate their studying on specific topics • Creating a consistent structure is beneficial to students on the spectrum who thrive with predictability
Other types of note-taking	• Can be combined with other types of note-taking, such as guided notes: provide a Cornell Notes template
Summary: Cornell notes help students organize notes into main ideas and details. They are helpful for students on the spectrum and can be used as a study guide. They can be used in conjunction with guided notes.	

Adapted from Bucks County Community College: http://faculty.bucks.edu/specpop/Cornl-ex.htm

Additional Resources

- **Cornell Notes**: http://en.wikipedia.org/wiki/Cornell_note-taking_system (or google ***guided notes wikipedia***)
- **Note Taking: Cornell Method:** http://www.usu.edu/arc/idea_sheets/pdf/note_taking_cornell.pdf (or google ***usu cornell method***)

Nine Types of Curriculum Adaptations

PARTICIPATION
Adapt the extent to which a learner is actively involved in the task

Examples:
- Thumbs up/thumbs down response
- Cue cards: clothes pins on paint chips
- Small group work with roles

QUANTITY
Adapt the number of items that the learner is expected to learn or number of activities student will complete prior to assessment for mastery

Examples:
- Reduce number of problems/body paragraphs/direct quotes required
- Shorten homework requirement
- Use checklists on which 3 out of 5 parts must be completed

TIME
Adapt the time allotted and allowed for learning, task completion, or testing

Examples:
- Increase amount of time given
- Allow to complete task at home
- Provide additional instruction time at recess, study hall, etc.

INPUT
Adapt the way instruction is delivered to student

Examples:
- Vary whole-class/small group, mini-lesson/discovery, oral/reading, etc.
- Include multimedia: video, audio, photographs, illustration
- Use manipulatives, hands-on materials

OUTPUT
Adapt how the student can respond to instruction

Examples:
- Allow options for work/assessments:
  - written
  - poster
  - oral presentation
  - technology

DIFFICULTY
Adapt the skill level, problem type, or the rules on how the learner may approach the work

Examples:
- All differentiated instruction
- Modify reading levels
- Modify tasks

LEVELS OF SUPPORT
Increase the amount of assistance to keep the student on task or to reinforce or prompt use of specific skills. Enhance adult-student relationship; use physical space and environmental structure.

Examples:
- Provide ask analysis/checklists
- Use guided notes & graphic organizers
- Provide small group and individual support

ALTERNATE GOAL
Adapt the goals or outcome expectations while using the same materials

When routinely utilized, this is only for students with moderate to severe disabilities

SUBSTITUTE CURRICULUM
Provide different instruction and materials to meet a learner's individual goals

When routinely utilized, this is only for students with moderate to severe disabilities

From Diana Browning Wright, 2005, altered with permission from Jeff Sprague, Ph.D. from an original by DeSchenes, C., Ebeling, D., & Sprague, J. (1994). Adapting Curriculum & Instruction in Inclusive Classrooms: A Teachers Desk Reference. ISDD- CSCI Publication.
Icons: Aaron Lanou, 2012