Supporting Strategies for Learning Abilities

	T & R	PS	WM	EoL & RoI	VK	VSR
Identify Key Parts Highlight important concepts and steps in a lesson			X			X
Model Teacher demonstrates a new concept or approach to learning while students observe	X	X	X	X		
Chunking Information Break larger amounts of information into smaller units		X	X	X		
Mnemonic Aids Students associate familiar words and phrases with terms they're struggling to remember	X		X			
Task Analysis A description of steps (mental or physical) or tasks needed to complete an activity		X	X	X		
Rote Repetition A memorization technique based on repetition and repeated learning			X	X		
Hands-On Learning Students learn and explore through concrete activities	X		X			X
Acronyms A word or name formed from initial letters of words or concepts as a type of abbreviation			X	X		
Music or Rhythm Adding concepts and steps to music or creating chants helps support retrieval of information			X	X		
Make Student Connections Connect learning to student experiences, interests, and/or real-world examples	X		X			
Graphic Organizers An organization tool or map that uses visual symbols to express knowledge	X	X	X	X	X	X
Games Make a game out of the concept(s) and skill(s) being taught			X			
Activate Prior Knowledge Building initial knowledge and connecting it to what students already know	X		X			
Stories and Scenarios Teach concepts using meaningful stories to which student(s) can relate			X			
Exemplars Provide visual examples of steps, processes, and concepts throughout the learning	X		X			X

Key: T&R = Thinking & Reasoning, PS = Processing Speed, WM = Working Memory, EoL = Efficiency of Learning, RoI = Retrieval of Information, VK = Vocabulary Knowledge, VSR = Visual Spatial Reasoning

Supporting Strategies for Learning Abilities

	T & R	PS	WM	EoL & RoI	VK	VSR
Include Note-Taking Handouts Provide handouts that will allow student(s) to take notes under the key points learned		X	X		X	
Multiple Means of Representing Information Teaching the same information in as many formats as possible to increase the chances of retention	X	X	X		X	X
Math Manipulatives Concrete objects that allow students to manipulate concepts to strengthen their learning	X		X	X		X
Concrete-Representational-Abstract Teach concepts using concrete objects first then link them to semi-concrete using pictures/visuals. Last, transition to abstract number sentences and word problems.	X	X	X	X	X	X
Emphasize Colors and Patterns Utilize colors and patterns in teaching and make them clearly defined for key information			X	X		X
Slow Down Instruction Take your time and present information as slowly as possible with embedded practice		X				X
Semantic Clustering Grouping information by category		X		X	X	
Integrating Strategies Using more than one strategy at a time				X		
Emotions Tied to Learning Emphasize concepts and skills by using a variety of emotions within scenarios as you teach				X		
Imagery A visual mode of teaching mathematical information that supports students in forming mental images				X		X
Elaboration of Information Linking new information with related prior knowledge	X	X		X		
Verbal and Visual Prompt Teacher guides the student(s) by providing step-by-step hints that lead to a direct answer		X		X		X
Study Cards Important information and steps condensed to a notecard that supports students in reviewing and recalling critical components of a lesson or process				X		

Key: T&R = Thinking & Reasoning, PS = Processing Speed, WM = Working Memory, EoL = Efficiency of Learning, RoI = Retrieval of Information, VK = Vocabulary Knowledge, VSR = Visual Spatial Reasoning

Supporting Strategies for Learning Abilities

	T & R	PS	WM	EoL & RoI	VK	VSR
Retrieval vs. Repeat Retrieval is repeatedly recalling and applying information across multiple units; repeat is to practice many times within the same lesson	X			X		
Chaining Strategy Individual steps in a process are broken down into small steps. Each step is taught within the sequence by itself.		X		X		
Dual Encoding Using both visual and verbal representation of information	X	X		X		
Verbal and Visual Cues A hint that does not lead the student to a direct answer		X		X		
Brief, Focused Small-Group Lessons Teacher reviews chunks of information with a small group of students for short periods	X			X		
Spiral Review Providing students with a repeated opportunity to practice skills previously taught				X		
Pre-Teach Key Terms Teach students vocabulary terms before they engage in the lesson	X				X	
Identify Key Terms Identify vocabulary and concepts by having students highlight, underline, or visually notate					X	
Label the Problem Students label parts of a math problem (e.g., sum, add, difference)					X	X
Create a Verbal Story from Math Equation Teacher turns a math equation into a verbal story by using the different parts in the story					X	
Student-Created Glossary Students develop their own definition of word based on their understanding					X	
Talk Aloud Talk out processes as solving and modeling mathematics	X	X			X	
Space Page Information Provide extra space with information on pages (letters, words, numbers, problems)						X
Color Code Directions Place directions in a different color than tasks. Be consistent with colors used throughout assignments.						X

Key: T&R = Thinking & Reasoning, PS = Processing Speed, WM = Working Memory, EoL = Efficiency of Learning, RoI = Retrieval of Information, VK = Vocabulary Knowledge, VSR = Visual Spatial Reasoning

Supporting Strategies for Learning Abilities

	T & R	PS	WM	EoL & RoI	VK	VSR
Visuals with Captions Provide descriptions of all visuals used on handouts		X				X
Limit Visual Stimuli Using a cover (e.g., notecard, blank paper), cover parts of the handout to reduce overstimulation		X				X
Use Wide-Ruled Paper Use wide-ruled paper when having students complete math work						X
Provide Graph Paper Use graph paper to help line up numbers and place value						X
Provide Copy of Class Notes Provide notes of class lessons, steps, and processes						X
Provide Lined Paper Turned Sideways An alternative to graph paper, students turn paper so lines appear vertically to help them line up numbers and place value						X
Provide Extra Time to Respond to Questions Allow students time to think and gather thoughts before expecting an oral response		X				X
Reduce Assignment Length Reduce the number of questions within the same TEKS/assignment		X				
Use Number Line to Strengthen Number Sense Use a number line to help with number sense and pattern recognition	X					
Require Students to Show Their Work Students show steps in their work to allow them to reflect on and justify their thinking	X					
Interactive Word Wall As students learn new words, add them to the wall along with a visual representation	X		X	X	X	X
Concept Circles Draw a circle. Divide the circle into parts (between 1 and 4 parts). Students sort pictures, problems, and terms according to like concepts (e.g., joining, separating).	X				X	

Key: T&R = Thinking & Reasoning, PS = Processing Speed, WM = Working Memory, EoL = Efficiency of Learning, RoI = Retrieval of Information, VK = Vocabulary Knowledge, VSR = Visual Spatial Reasoning

Learning Abilities

Thinking & Reasoning

Thinking and Reasoning is the use of deliberate and controlled procedures (often requiring focused attention) to solve novel, on-the-spot problems that cannot be solved by using previously learned habits, schemas, and scripts. (McGrew and Schneider 2018)

Deductive and inductive reasoning are primary characteristics.

- Analyzing novel problems
- Identifying patterns and relationships in math problems
- Solving problems using new procedures
- Applying logic

Instructional Strategies for Thinking & Reasoning

Model	Multiple means of representing information	Brief, focused small-group lessons
Mnemonic aids	Pre-teach mathematical terminology	Talk aloud
Make student connections	Math manipulatives	Use number line to strengthen number sense
Graphic organizers	Concrete-Representational-Abstract	Require students to show their work
Activate prior knowledge	Elaboration of information	Interactive word wall
Exemplars	Retrieval vs. Repeat	Concept circles
Emphasize colors and patterns	Dual encoding	Chaining strategy

Learning Abilities

Processing Speed

Processing speed is the ability to control attention to automatically, quickly, and fluently perform relatively simple repetitive cognitive tasks. (McGrew and Schneider 2018)

Includes attentional fluency or attentional speediness

- Memorizing basic math facts
- Math reasoning skills
- Intentionally extending wait time
- Reducing the quantity of work in favor of quality

- Pattern recognition
- Ability to compare items
- Providing activities that build rate and fluency
- Chunking assignments and providing appropriate time for each chunk

Instructional Strategies for Processing Speed

Model	Concrete-Representational-Abstract	Dual encoding
Chunking information	Subitizing	Verbal and visual cues
Task analysis	Slow down instructions	Talk aloud
Mnemonic aids	Semantic clustering	Visuals with captions
Graphic organizers	Elaboration of information	Limit visual stimuli
Include note-taking handouts	Visual and verbal prompts	Extra time to respond to questions
Multiple means of representing information	Chaining strategy	Reduce assignment length

Learning Abilities

Efficiency of Learning and Retrieval of Information

Efficiency of Learning

The ability to learn, store, and consolidate new information over periods of time measured in minutes, hours, days, and years. (McGrew and Schneider 2018)

- Ability to recall multi-step procedures
- Ability to complete tasks on time
- Ability to focus during learning and memorization
- Ability to connect new information to previous information

Retrieval of Information

The rate and fluency at which individuals can access information stored in long-term memory. (McGrew and Schneider 2018)

- Ability to recall information that repeatedly has been studied
- Ability to not repeatedly make the same mistakes

Instructional Strategies for Efficiency of Learning and Retrieval of Information

Rote repetition	Chunking information	Acronyms
Model	Imagery	Chaining strategy
Semantic clustering	Elaboration of information	Dual encoding
Integrating strategies	Graphic organizers	Verbal and visual cues and prompts
Task analysis	Assess periodically on new information	Brief, focused small-group lessons
Music	Study cards	Spiral review
Emotions tied to learning	Retrieval vs. Repeat	Math manipulatives

Learning Abilities

Working Memory

The ability to maintain and manipulate information in active attention.
The mind's mental "scratchpad" or “workbench.” (McGrew and Schneider 2018)

Loses information quickly through decay of memory traces, unless individual activates other cognitive resources to maintain the information in immediate awareness.

- Forget information on a skill previously learned
- Trouble remembering components of multi-step tasks
- Unable to recall information just read
- Forgets what they are doing in the middle of a task
- Unable to concentrate on task
- Struggles with understanding instructions
- Struggles with manipulating problem information

Instructional Strategies for Working Memory

Identify key takeaways	Use acronyms	Exemplars
Model	Use of music or rhythm	Collaborative learning
Chunk information	Make student connections	Multiple means of representing information
Mnemonic aids	Graphic organizers	Use of math manipulatives
Task analysis	Visuals	Concrete-Pictorial-Abstract
Rote practice exercises	Activate prior knowledge	Emphasize colors and patterns
Hands-on learning	Use of stories or scenarios	Present new concepts one step at a time

Learning Abilities

Vocabulary Knowledge

Vocabulary knowledge is directly related to background knowledge. Vocabulary knowledge includes knowledge of the definitions of words and the concepts that underlie them. (McGrew and Schneider 2018)

Language development is more about understanding words in context. Vocabulary knowledge is more about understanding the definitions of words in isolation.

- Number representation
- Quantifying sets without counting
- Understanding context of math vocabulary
- Number comparisons
- Estimating relative magnitude of sets

Instructional Strategies for Vocabulary Knowledge

Pre-teach key terms	Concept circles	Note-taking handouts with close activities
Label the problem	Graphic organizers	Emotions tied to learning
Create a verbal story from a math equation	Concrete-Representational-Abstract	Imagery
Student-created glossary	Make student connections	Study cards
Talk aloud	Activate prior knowledge	Visuals with captions
Interactive word wall	Stories and scenarios	Music or rhythm

Learning Abilities

Visual Spatial Reasoning

Visual spatial reasoning is the ability to make use of simulated mental imagery (often in conjunction with currently perceived images) to solve problems. (McGrew and Schneider 2018)

Perceiving, discriminating, and manipulating images in the "mind's eye."

- Abstract reasoning
- Recognizing patterns
- Reading graphs and charts
- Number alignment

- Recalling visual information
- Recognition of spatial characteristics of objects (e.g., size, length)

Instructional Strategies for Visual Spatial Reasoning

Imagery	Chunking information	Label the problem
Model	Graphic organizers	Space page information
Identify key parts	Story boards for scenarios	Color code directions
Emphasize colors and patterns	Graphic organizers	Visuals with captions
Task analysis	Note-taking handouts with close activities	Limit visual stimuli
Slow down instruction	Study cards with pictures	Wide-ruled paper
Visual and verbal prompts	Math manipulatives	Interactive word wall

Dyslexia

Definition

A disorder of constitutional origin manifested by a difficulty in learning to read, write, or spell, despite conventional instruction, adequate intelligence, and sociocultural opportunity. TEC § 38.003(d)(1)-(2) (1995)

Primary

- Difficulty with accurate and/or fluent word reading
- Poor spelling skills
- Poor decoding ability

Secondary

- Reading comprehension
- Vocabulary and background knowledge

Adapted from the International Dyslexia Association Board of Directors (November 12, 2002).

Instructional Accommodations for Students with Dyslexia

Copies of notes (e.g., teacher or peer provided)	Note-taking assistance	Additional time on class assignments and tests
Reduced/shortened assignments (e.g., chunking assignments into manageable units, fewer items given on a classroom test or homework assignment without eliminating concepts, or student planner to assist with assignments)	Alternative test location that provides a quiet environment and reduces distractions	Priority seating assignment
Oral reading of directions or written material	Word banks	Text to speech
Speech to text	Formula charts	Electronic dictionaries/spellers
Break problems into smaller steps	Take time to reteach and provide immediate feedback	Use grid paper
Present information in small increments and at a slower pace		Explain meaning of key terms (i.e., add can be represented by increased by, add to, twice a number, etc.)

Dysgraphia
Dyslexia-Related Disorders

Dysgraphia is best defined as a neurodevelopment disorder manifested by illegible and/or inefficient handwriting due to difficulty with letter formation. This difficulty is the result of deficits in graphomotor function (hand movements used for writing) and/or storing and retrieving orthographic codes (letter forms) (Berninger 2015).

Examples of Impact

Primary	Deficits in graphomotor function (hand movements used for writing)	Storing and retrieving orthographic codes (letter forms)
Secondary	Spelling	Written Expression

- Variably shaped and poorly formed letters
- Excessive erasures and cross-outs
- Poor spacing between letters and words
- Letter and number reversals beyond early stages of writing
- Awkward, inconsistent pencil grip
- Heavy pressure and hand fatique
- Slow writing and copying with legible or illegible handwriting

Accommodations/Instructional Strategies for Dysgraphia

Provide paper assignments with name, date, title, etc., already filled in.	Provide copies of notes or assign a note-taking buddy to assist with filling in missing information.	Use graph paper for math or turn lined paper sideways to help with lining up columns of numbers.
Offer an alternative to a written project such as an oral report, dramatic presentation, or visual media project.	Use pencil grips or different types of pens or pencils to see what works best for the student.	Provide handouts so there's less to copy from the board.
Provide paper with different-color or raised lines to help form letters in the right space.	Help the student break writing assignments into steps.	Adapt test formats to cut down on handwriting. For example, use circle-the-answer or fill-in-the-blank questions.
Upload worksheets into an electronic form so students can type in answers.		Provide word processor or speech text for written assignments.

References

Almarode, John, Douglas Fisher, Kateria Thunder, John Hattie, and Mancy Frey. 2019. Teaching Mathematics in the Visible Learning Classroom, Grades K–12. Oaks, CA: Corwin, a SAGE Company.

Caldwell, Janet H., Beth Kobett, and Karen Karp. 2016. Putting Essential Understanding of Addition and Subtraction into Practice in Prekindergarten–Grade 2. Reston, VA: The National Council of Teachers of Mathematics.

Carroll, John B. 1993. "Survey and Analysis of Correlational and Factor-Analytic Research on Cognitive Abilities: Methodology." Human Cognitive Abilities, 73–114. https://doi.org/10.1017/cbo9780511571312.004.

CAST. 2018. Universal Design for Learning Guidelines, Version 2.2. Accessed January 14, 2020. http://udlguidelines.cast.org.

Clements, Douglas H., and Julie Sarama. 2014. Learning and Teaching Early Math: The Learning Trajectories Approach. New York, NY: Routledge.

Dixon, Juli K., Edward C. Nolan, Thomasenia Lott Adams, Lisa A. Brooks, and Tashana D. Howse. 2016. Making Sense of Mathematics for Teachers, Grades K–2. Bloomington, IN: Solution Tree Press.

Dougherty, Barbara J., and Karen S. Karp. 2019. Putting Essential Understanding of Number and Numeration into Practice in Pre-K–Grade 2. Reston, VA: The National Council of Teachers of Mathematics.

Feifer, Steven G. 2017. The Neuropsychology of Mathematics: An Introduction to the FAM. Middletown, MD: School Neuropsych Press.

Flanagan, Dawn P. 2008. "The Cattell-Horn-Carroll Theory of Cognitive Abilities." Encyclopedia of Special Education, 136–182. https://doi.org/10.1002/9780470373699.speced0381.

International Dyslexia Association. n.d. "Definition of Dyslexia." Accessed January 30, 2020. https://dyslexiaida.org/definition-of-dyslexia/.

Karten, Toby. 2017. Building on the Strengths of Students with Special Needs: How to Move Beyond Disability Labels in the Classroom. Alexandria, VA: ASCD.

Loveless, Becton. n.d. "Effective Memory Strategies for Special Needs Children: The Ultimate Guide." Education Corner: Education That Matters. Accessed January 17, 2020. https://www.educationcorner.com/special-needs-memory-strategies.html.

Mascolo, Jennifer T., Vincent C. Alonso, and Dawn P. Flanagan. 2014. Essentials of Planning, Selecting, and Tailoring Interventions for Unique Learners. Hoboken, NJ: John Wiley & Sons, Inc.

McGrew, Kevin S. 2006. "CHC Theory: Fluid Intelligence (Gf)." Accessed February 3, 2020. http://www.iqscorner.com/2006/11/chc-theory-what-is-fluid-intelligence.html.

Morin, Amanda. n.d. "Classroom Accommodations for Dysgraphia." Accessed February 3, 2020. https://www.understood.org/en/school-learning/partnering-with-childs-school/instructional-strategies/at-a-glance classroomaccommodations-for-dysgraphia.

Proctor, Briley E., Randy G. Floyd, Renee B. Shaver. 2004. "Cattell-Horn-Caroll Broad Cognitive Ability Profiles of Low Math Achievers." Accessed February 3, 2020. https://doi.org/10.1002/pits.20030.

Schneider, W. Joel, and Kevin S. McGrew. 2018. "Cattell-Horn-Carroll Theory of Intelligence." In Contemporary Intellectual Assessment: Theories, Tests, and Issues, edited by Dawn P. Flanagan and Erin M. McDonough, 73–163. New York, NY: The Guilford Press.

Sharma, Mahesh. 2016. "Work Memory: Role in Mathematics Learning (Part Two)." Mathematics for All. Accessed November 28, 2019. https://mathlanguage.wordpress.com/2016/11/10/working-memory-its-role-in-mathematics-learning-part-two/.

Sousa, David A. 2016. How the Special Needs Brain Learns (3rd ed.). Thousand Oaks, CA: Corwin Press.

Tapper, John. 2012. Solving for Why: Understanding, Assessing, and Teaching Students Who Struggle with Math. Sausalito, CA: Math Solutions.

"The UDL Guidelines." UDL, August 31, 2018. http://udlguidelines.cast.org/.

Thorne, Glenda. 2003. "What Strategies Can Be Used To Increase Memory?" Blog—Latest News. The Center for Development and Learning. https://www.cdl.org/articles/what-strategies-can-be-used-to-increase-memory/.