Academic Intervention Planner for Struggling Students

This form provides descriptions of the selected intervention, a listing of research articles supporting the intervention ideas, and space for teacher notes.

Academic Intervention Strategies	Research Citations	Teacher Notes
❑ MATH: INSTRUCTION: PEER-GUIDED PAUSE. During large-group math lectures, teachers can help students to retain more instructional content by incorporating brief Peer Guided Pause sessions into lectures: (1) Students are trained to work in pairs. At one or more appropriate review points in a lecture period, the instructor directs students to pair up to work together for 4 minutes. (2) During each Peer Guided Pause, students are given a worksheet that contains one or more correctly completed word or number problems illustrating the math concept(s) currently being reviewed in the lecture. The sheet also contains several additional, similar problems that pairs of students must work cooperatively to complete, along with an answer key. (3) Student pairs are reminded to (a) monitor their understanding of the lesson concepts; (b) review the correctly math model problem; (c) work cooperatively on the additional problems, and (d) check their answers. (4) The teacher can direct student pairs to write their names on the practice sheets and collect the work as a convenient way to monitor student participation and understanding.	Hawkins, J., & Brady, M. P. (1994). The effects of independent and peer guided practice during instructional pauses on the academic performance of students with mild handicaps. Education & Treatment of Children, 17 (1), 1-28.	
❑ MATH: SHORTCUTS: ADDITION. Teach the student these shortcuts to help with basic addition: (1) The order of the numbers in an addition problem does not affect the answer. (2) When zero is added to the original number, the answer is the original number. (3) When 1 is added to the original number, the answer is the next larger number.	Miller, S.P., Strawser, S., & Mercer, C.D. (1996). Promoting strategic math performance among students with learning disabilities. LD Forum, 21(2), 34-40.	
❑ MATH: SHORTCUTS: SUBTRACTION. Teach the student these shortcuts to help with basic subtraction: (1) When zero is subtracted from the original number, the answer is the original number. (2) When 1 is subtracted from the original number, the answer is the next smaller number. (3) When the original number has the same number subtracted from it, the answer is zero.	4 Miller, S.P., Strawser, S., & Mercer, C.D. (1996). Promoting strategic math performance among students with learning disabilities. LD Forum, 21(2), 34-40.	

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❑ MATH: SHORTCUTS: MULTIPLICATION. Teach the student these shortcuts to help with basic multiplication: (1) When a number is multiplied by zero, the answer is zero. (2) When a number is multiplied by 1, the answer is the original number. (3) When a number is multiplied by 2, the answer is equal to the number being added to itself. (4) The order of the numbers in a multiplication problem does not affect the answer.	4 Miller, S.P., Strawser, S., & Mercer, C.D. (1996). Promoting strategic math performance among students with learning disabilities. LD Forum, 21(2), 34-40.	
❑ MATH: SHORTCUTS: DIVISION. Teach the student these shortcuts to help with basic division: (1) When zero is divided by any number, the answer is zero. (2) When a number is divided by 1, the answer is the original number. (3) When a number is divided by itself, the answer is 1.	Miller, S.P., Strawser, S., & Mercer, C.D. (1996). Promoting strategic math performance among students with learning disabilities. LD Forum, 21(2), 34-40.	
❑ MATH: COMPUTATION STRATEGY: SUBTRACTION: COUNT-UP. Train the student to use this strategy to complete basic subtraction operations: (1) The student is given a copy of a number-line spanning 0-20. (2) The student is taught to refer to the first number appearing in the subtraction problem (the minuend) as 'the number you start with' and to refer to the number appearing after the minus (subtrahend) as 'the minus number'. (3) The student is directed to start at the minus number on the number-line and --from that start point--to count up to the starting number while keeping a running tally of numbers counted up on his or her fingers. (4) The final tally of digits separating the minus number and starting number is the answer to the subtraction problem.	Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D., & Hamlett, C. L. (2009). The effects of strategic counting instruction, with and without deliberate practice, on number combination skill among students with mathematics difficulties. Learning and Individual Differences 20(2), 89-100.	
❑ MATH: COMPUTATION STRATEGY: ADDITION: COUNT-UP. Train the student to use this strategy to complete basic addition operations: (1) The student is given a copy of a number-line spanning 0-20. (2) When presented with a two-addend addition problem, the student is taught to start with the larger of the two addends and to 'count up' by the amount of the smaller addend to arrive at the answer to the addition problem.	Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D., & Hamlett, C. L. (2009). The effects of strategic counting instruction, with and without deliberate practice, on number combination skill among students with mathematics difficulties. Learning and Individual Differences 20(2), 89-100.	

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❑ MATH: COMPUTATION STRATEGY: MULTIPLICATION: COUNT-BY. Train the student to use this strategy to complete basic multiplication operations: (1) The student looks at the two terms of the multiplication problem and chooses one of the terms as a number that he or she can count by (the 'count by' number). (2) The student takes the remaining term from the multiplication problem (the 'count times' number) and makes a corresponding number of tally marks to match it. (3) The student starts counting using the 'count by' number. While counting, the student touches each of the tally marks matching the 'count times' number. (4) The student stops counting when he or she has reached the final tally-mark. (5) The student writes down the last number said as the answer to the multiplication problem.	Cullinan, D., Lloyd, J., & Epstein, M.H. (1981). Strategy training: A structured approach to arithmetic instruction. Exceptional Education Quarterly, 2, 41-49.	
❑ MATH: ARITHMETIC FACTS: ACQUISITION: COVER-COPY-COMPARE. To memorize arithmetic facts, the student can be trained to independently use Cover-Copy-Compare: The student is given a worksheet with computation problems and answers appearing on the left side of the sheet, and the right side of the page left blank. The student is also given an index card. For each arithmetic-fact item, the student is directed (1) to study the correct arithmetic problem and answer on the left, (2) to cover the correct model with the index card, (3) from memory, to copy the arithmetic fact and answer onto the work space on the right side of the sheet, and (4) to compare the student version of the arithmetic fact and answer to the original model to ensure that it was copied correctly and completely.	Skinner, C. H., McLaughlin, T. F., & Logan, P. (1997). Cover, copy, and compare: A self-managed academic intervention effective across skills, students, and settings. Journal of Behavioral Education, 7, 295-306.	

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❑ MATH: ARITHMETIC FACTS: ACQUISITION: INCREMENTAL REHEARSAL. Incremental rehearsal is a useful strategy to help the student to acquire arithmetic facts. Sessions last 10-15 minutes. In preparation for this intervention, the teacher prepares a set of arithmetic-fact flashcards displaying equations but no answers. The teacher reviews all of the flashcards with the student. Flashcards that the student correctly answers within 2 seconds are sorted into a 'KNOWN' pile, while flashcards for which the student gives an incorrect answer or hesitates for longer than 2 seconds are sorted into the 'UNKNOWN' pile. During the intervention: (1) the teacher selects a card from the UNKNOWN pile (Card UK1), presents it to the student, reads off the arithmetic problem, and provides the answer (e.g., '4 x 8=32'). The student is then prompted to read the problem and give the correct answer (2) Next, the teacher selects a card from the KNOWN pile (Card K1) and adds it to the previously practiced card (UK1). In succession, the teacher shows the student the unknown (UK1) and the known (K1) card. The student has 2 seconds to provide an answer for each card. Whenever the student responds incorrectly or hesitates for longer than 2 seconds, the teacher corrects student responses as needed and has the student state the correct response. (3) The teacher then selects a second card from the KNOWN pile (card K2) and adds it to the student stack--reviewing cards UK1, K1, and K2. (4) This incremental review process repeats until the student's flashcard stack comprises 10 cards: 1 unknown and 9 known. (5) At this point, the original unknown card (UK1) is now considered to be a 'known' card and is retained in the student's review-card stack. To make room for it, the last known card (K9) is removed, leaving 9 known cards in that student's stack. (6) The teacher then draws a new card from the UNKNOWN pile (card UK2) and repeats the incremental review process described above, each time adding known cards from the 9-card student stack in incremental fashion.	Burns, M. K. (2005). Using incremental rehearsal to increase fluency of single-digit multiplication facts with children identified as learning disabled in mathematics computation. Education and Treatment of Children, 28, 237-249.	

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❑ MATH COMPUTATION STRATEGY: ACQUISITION: STUDENT HIGHLIGHTING. Students who are inattentive or impulsive can improve their accuracy and fluency on math computation problems through student-performed highlighting. The student is given highlighters of several colors and a math computation sheet. Before completing the worksheet, the student is directed to color-code the problems on the sheet in a manner of his or her choosing (e.g., by level of difficulty, by math operation). The student then completes the highlighted worksheet.	Kercood, S., & Grskovic, J. A. (2009). The effects of highlighting on the math computation performance and off-task behavior of students with attention problems. Education and Treatment of Children, 32, 231-241.	
❑ MATH: ARITHMETIC FACTS: FLUENCY: PERFORMANCE FEEDBACK & GOAL-SETTING. The student gets regular feedback about computation fluency and sets performance goals. In preparation for this intervention, the teacher decides on a fixed time limit for worksheet drills (e.g., 5 or 10 minutes) --with an equivalent worksheet to be prepared for each session. In each session, before the student begins the worksheet, (1) the teacher provides the student with feedback about the number of correct problems and errors on the most recent previous worksheet, and (2) the teacher and student agree on an improvement-goal for the current worksheet (e.g., to increase the number of correct problems by at least 2 and to reduce the errors by at least 1). Student performance on worksheets is charted at each session.	Codding, R. S., Baglici, S., Gottesman, D., Johnson, M., Kert, A. S., & LeBeouf, P. (2009).Selecting intervention strategies: Using brief experimental analysis for mathematics problems. Journal of Applied School Psychology, 25, 146-168.	

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❑ MATH: ARITHMETIC FACTS: FLUENCY: PROVIDE INCENTIVES. A student may benefit from incentives to increase fluency with math facts. BRIEF ANALYSIS: The teacher first conducts a brief experimental analysis to determine whether incentives will increase a particular student's performance: (1) The student is given a worksheet with arithmetic facts and allotted two minutes to complete as many items as possible. The student receives a point for each correct digit written on the worksheet. (2) The teacher next prepares an equivalent worksheet with different problems--but composed of the same type and number of problems. (3) Before administering the second worksheet, the teacher presents the student with a 'prize bag' with tangible items (e.g., markers, small toys) and perhaps edible items (e.g., packaged raisins, crackers, etc.). The student is told that if he/she can increase performance on the second worksheet by at least 30%, the student will earn a prize. The student is asked to select a preferred prize from the prize bag. (4) The student is given the second worksheet and works on it for 2 minutes. Again, the worksheet is scored for correct digits. (5) If the student meets the fluency goal, he/she receives the selected prize. If the student fails to meet the goal, he/she is given a sticker as a consolation prize. USE OF INCENTIVES: The teacher uses incentives only if the preceding brief analysis indicates that incentives are an effective motivator. For this intervention, the teacher decides on a fixed time limit for worksheet drills (e.g., 5 or 10 minutes) --with an equivalent worksheet to be prepared for each session. In each session, before the student begins the worksheet, (1) the student is asked to select a potential prize from the prize bag, (2) the student reviews his/her most recent previous worksheet score, and (3) the student and teacher set an improvement goal for the current worksheet (e.g., to exceed the previous score by at least 2 correct digits). If the student meets the goal, he/she is given the prize; if the student falls short, the teacher provides verbal encouragement and perhaps a sticker as a consolation prize. Student performance on worksheets is charted at each session.	Codding, R. S., Baglici, S., Gottesman, D., Johnson, M., Kert, A. S., & LeBeouf, P. (2009).Selecting intervention strategies: Using brief experimental analysis for mathematics problems. Journal of Applied School Psychology, 25, 146-168.	

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❑ MATH: ARITHMETIC FACTS: FLUENCY: TIME DRILLS. Explicit time-drills are a method to boost students' rate of responding on arithmetic-fact worksheets: (1) The teacher hands out the worksheet. Students are instructed that they will have 3 minutes to work on problems on the sheet. (2) The teacher starts the stop watch and tells the students to start work. (3) At the end of the first minute in the 3-minute span, the teacher 'calls time', stops the stopwatch, and tells the students to underline the last number written and to put their pencils in the air. Then students are told to resume work and the teacher restarts the stopwatch. (4) This process is repeated at the end of minutes 2 and 3. (5) At the conclusion of the 3 minutes, the teacher collects the student worksheets.	Rhymer, K. N., Skinner, C. H., Jackson, S., McNeill, S., Smith, T., & Jackson, B. (2002). The 1-minute explicit timing intervention: The influence of mathematics problem difficulty. Journal of Instructional Psychology, 29(4), 305-311. Skinner, C. H., Pappas, D. N., & Davis, K. A. (2005). Enhancing academic engagement: Providing opportunities for responding and influencing students to choose to respond. Psychology in the Schools, 42, 389-403.	
❑ MATH: WORD PROBLEMS: ACQUISITION: USE WORKED EXAMPLES. Students acquiring math skills in the form of word-problems benefit from being given completed problems ('worked examples') to study. Teachers should observe these recommendations when formatting, teacher, and using worked examples as a student support: (1) FORMAT PROBLEM-SOLVING STEPS: the solution presented in the worked example should be broken down into discrete, labeled sub-steps/sub-goals corresponding to the appropriate process for solving the problem. (2) COMBINE TEXT AND GRAPHICS. If both text and visual elements appear in the worked example, they should be integrated into a single unitary display, if possible, rather than split into separate components--so as not to overwhelm the novice learner. (3) PAIR WORKED WITH UNWORKED EXAMPLES. Whenever the student is given a worked example to study, he or she should then immediately be presented with 1-2 similar examples to solve.	Atkinson, R. K., Derry, S. J., Renkl, A., & Wortham, D. (2000). Learning from examples: Instructional principles from the worked examples research. Review of Educational Research, 70(2), 181-214.	

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❑ MATH: WORD PROBLEMS: METACOGNITION: PAIRING WORKED EXAMPLES WITH SELF-EXPLANATION. Students who can coach themselves through math problem-solving steps ('self-explanation') demonstrate increased conceptual understanding of the task. The student should be explicitly coached to 'self-explain' each of the steps to be used in solving a particular type of problem--starting with completed problems ('worked examples') before advancing to unworked problems: (1) INTRODUCTION TO SELF-EXPLANATION. The teacher first explains the importance of self-explanation as a student math self-help skill. (2) TEACHER MODELING. Next, the teacher models self-explanation, applying the appropriate problem-solving steps to a worked example. (3) STUDENT MODELING WITH TEACHER FEEDBACK. The teacher then coaches the student's own self-explanation efforts, as the student moves through the steps of a second worked example. (4) INDEPENDENT STUDENT APPLICATION. When the student has successfully mastered the process, he or she is directed to use self-explanation during the problem-solving steps with any unworked problems.	Atkinson, R. K., Derry, S. J., Renkl, A., & Wortham, D. (2000). Learning from examples: Instructional principles from the worked examples research. Review of Educational Research, 70(2), 181-214. Tajika, H., Nakatsu, N., Nozaki, H., Neumann, E., & Maruno, S. (2007). Self-explanation for solving mathematical word problems: Effects of self-explanation as a metacognitive strategy for solving mathematical word problems. Japanese Psychological Research, 49(3), 222-233.	
❑ MATH: WORD PROBLEMS: STRATEGY: DRAW THE PROBLEM. The student can clarify understanding of a word problem by making a drawing of it before solving. To teach this strategy: (1) The teacher gives the student a worksheet containing at least six word problems. (2) The teacher explains to the student that making a picture of a word problem can make that problem clearer and easier to solve. (3) The teacher and student independently create drawings of each of the problems on the worksheet. (4) Next, the student shows his or her drawings for each problem while explaining each drawing and how it relates to the word problem. (5) The teacher also participates, explaining his or her drawings to the student. (6) The student is then directed to 'draw the problem' whenever solving challenging word problems.	Van Garderen, D. (2006). Spatial visualization, visual imagery, and mathematical problem solving of students with varying abilities. Journal of Learning Disabilities, 39, 496-506.	

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❑ MATH: WORD PROBLEMS: STRATEGY: 4-STEP PLANNING PROCESS. The student can consistently perform better on applied math problems when following this efficient 4-step plan: (1) UNDERSTAND THE PROBLEM. To fully grasp the problem, the student may restate the problem in his or her own words, note key information, and identify missing information. (2) DEVISE A PLAN. In mapping out a strategy to solve the problem, the student may make a table, draw a diagram, or translate the verbal problem into an equation. (3) CARRY OUT THE PLAN. The student implements the steps in the plan, showing work and checking work for each step. (4) LOOK BACK. The student checks the results. If the answer is written as an equation, the student puts the results in words and checks whether the answer addresses the question posed in the original word problem.	Pólya, G. (1957). How to solve it (2nd ed.). Princeton University Press: Princeton, N.J. Williams, K. M. (2003). Writing about the problem solving process to improve problem-solving performance. Mathematics Teacher, 96(3), 185-187.	
❑ MATH: WORD PROBLEMS: STRATEGY: SELF-CORRECTION CHECKLISTS. The student can improve accuracy on particular types of word and number problems by using an 'individualized self-instruction checklist' to direct attention to his or her unique error patterns: (1) To create such a checklist, the teacher meets with the student. Together they analyze common error patterns that the student tends to commit on a particular problem type (e.g., 'On addition problems that require carrying, I don't always remember to carry the number from the previously added column.'). For each type of error identified, the student and teacher together describe the appropriate step to take to prevent the error from occurring (e.g., 'When adding each column, make sure to carry numbers when needed.'). (2) These self-check items are compiled into a single checklist. (3) The student is encouraged to use the individualized self-instruction checklist when working independently on number or word problems. TIP: As older students become proficient in creating and using these individualized error checklists, they can begin to analyze their own math errors and to make their checklists independently whenever they encounter new problem types.	Uberti, H. Z., Mastropieri, M. A., & Scruggs, T. E. (2004). Check it off: Individualizing a math algorithm for students with disabilities via self-monitoring checklists. Intervention in School and Clinic, 39(5), 269-275.	

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❑ MATH: WORD PROBLEMS: STRATEGY: 7-STEP PLANNING PROCESS. Students with a consistent strategy to take on math word problems work more efficiently and avoid needless errors. Presented here is an all-purpose 7-step cognitive strategy useful for solving any math word problem: This strategy should be formatted as a checklist for independent student use: (1) READ THE PROBLEM. The student reads the problem carefully, noting and attempting to clear up any areas of uncertainly or confusion (e.g., unknown vocabulary terms). (2) PARAPHRASE THE PROBLEM. The student restates the problem in his or her own words. (3) DRAW THE PROBLEM. The student creates a drawing of the word problem, converting words to a visual representation of that problem. (4) CREATE A PLAN TO SOLVE. The student decides on the best way to solve the problem and develops a plan to do so. (5) PREDICT/ESTIMATE THE ANSWER. The student estimates or predicts what the answer to the problem will be. The student may compute a quick approximation of the answer, using rounding or other shortcuts. (6) COMPUTE THE ANSWER. The student follows the plan developed previously to solve the problem and arrive at the correct answer. (7) CHECK THE ANSWER. The student methodically checks the calculations for each step of the problem. The student also compares the actual answer to the estimated answer calculated in a previous step to ensure that there is general agreement between the two values.	Montague, M. (1992). The effects of cognitive and metacognitive strategy instruction on the mathematical problem solving of middle school students with learning disabilities. Journal of Learning Disabilities, 25, 230-248. Montague, M., & Dietz, S. (2009). Evaluating the evidence base for cognitive strategy instruction and mathematical problem solving. Exceptional Children, 75, 285-302.	
❑ MATH WORD PROBLEMS: HIGHLIGHT KEY TERMS. Students who have difficulties with inattention or impulsivity can increase rates of on-task behavior and accuracy on math word problems through highlighting of key terms. The teacher prepares the worksheet by using a colored highlighter to highlight a combination of 8-11 key words and numbers for each math word problem. The student then completes the highlighted worksheet.	Kercood, S., Zentall, S. S., Vinh, M., & Tom-Wright, K. (2012). Attentional cuing in math word problems for girls at-risk for ADHD and their peers in general education settings. Contemporary Educational Psychology, 37, 106-112.	