Changing Instruction to Increase Achievement for Students With Moderate to Severe Intellectual Disabilities

Shawnee Wakeman, Meagan Karvonen, and Audra Ahumada

Mrs. Lee, an elementary school special education teacher for students with moderate to severe intellectual disabilities, is struggling with what to do for two of her students who appear to have hit the proverbial wall with adding fractions. Although they previously performed parts of the skill with accuracy (i.e., Student One completed 6 of the 8 steps including finding the correct answer for 3 days, and Student Two completed 7 of the 8 steps for 4 days), the students have regressed in recent days. Neither student can successfully complete all of the steps to find the correct answer. Mrs. Lee has provided each student with a task analysis of how to solve the problems, fraction strips to represent parts of a whole, and several models. In the context of teaching fractions within a recipe, she has marked the measuring cup and spoons to help provide a visual support for increasing the amounts in fraction form. Mrs. Lee is sure she is teaching the skill correctly as she consulted her general education partner for confirmation, but she is not sure how to teach it any differently. She has noticed that these two students have begun to act out during math by throwing their materials on the floor, circling their answers without trying to complete any step of the task analysis (i.e., guessing), or simply refusing to do their work at all. A change has to occur, but Mrs. Lee is not sure what to do next.

Mrs. Lee is not alone. Many teachers struggle to find other ways to teach content when students simply fail to make progress and have minimal engagement in their learning. This challenge can be exacerbated for special education teachers who may not have a deep content knowledge of all that the Common Core State Standards (CCSS; available at http://www.corestandards.org) demand of both teacher and learner. Recognizing the need to make an instructional change is different than having the skills to do so, which is the basis of this article.

Academics have been a required focus in instruction for students with significant cognitive disabilities since the reauthorization of the Individuals With Disabilities Education Act (IDEA) in 1997 and in alternate assessments since 2001. Although the CCSS are relatively new, most teachers of students with moderate and severe disabilities have revised their instructional approach to address state standards in the last decade to prepare students for the alternate assessments. The CCSS were written to represent the knowledge and skills necessary for all students, including those with moderate and severe intellectual disabilities. This population represents a very heterogeneous population with diverse skills and needs. Although teachers are making strides in their efforts to cover content that had previously not been taught to this population, often they need support on adjusting instruction. This article outlines several ways teachers can change their instruction and their expectations for student learning.

Ways to Change Instruction

In working with the CCSS, Mrs. Lee can use several approaches to change instruction with the goal being to improve student achievement. For example, Mrs. Lee's students may

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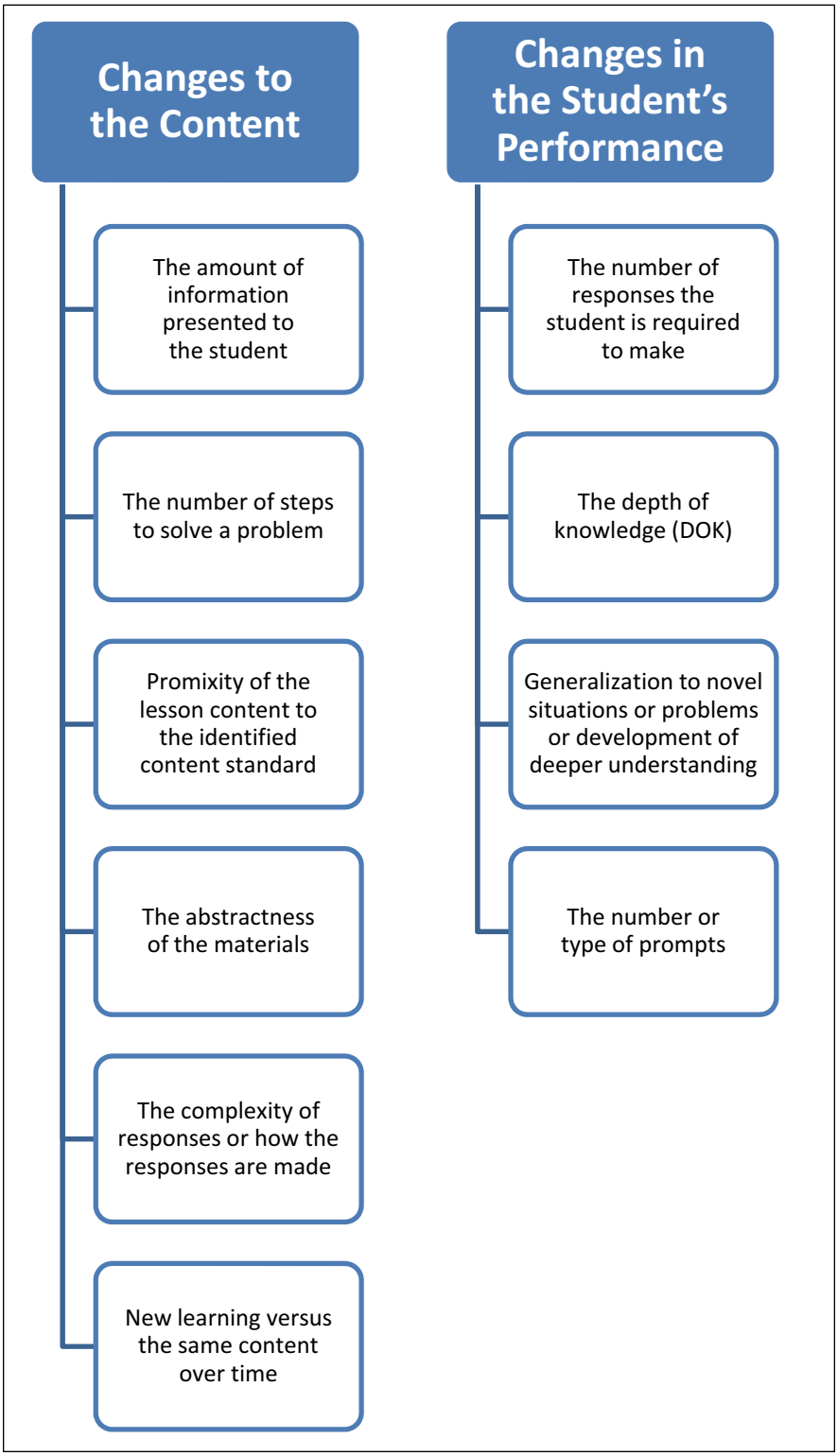
need a variety of response modes initially to get students to demonstrate their knowledge, or students may need to make fewer responses within the task analysis until mastery of that content can be achieved. The goal is that students make progress toward the total task using backward or forward chaining (Spooner, Browder, & Mims, 2011). Task analytic instruction begins by breaking a task into parts or steps and then teaching each part or step to the student in sequence. Numerous research studies have been published that address a variety of topics using task analytic instruction (e.g., math word problems [Browder, Jimenez, & Trela, 2012], scientific inquiry [Courtade, Browder, & Spooner, 2010], homework completion [Hampshire, Butera, & Bellini, 2011], and vocational assembly training [Lee & Singer-Dudek, 2012]). Backward and forward chaining involve training the student step by step to complete a task, either starting by teaching the student to perform the first step in the task sequence (forward chaining) or starting by teaching the student to perform the last step (backward chaining) to a specific criterion before adding the next step to the instructional sequence. The functional tasks of washing hands or using a vending machine, for example, can be broken into discrete steps that can then be taught using forward or backward chaining. Wakeman, Karvonen, and Flowers (2013) outlined change that can occur in the instructional format in which students with significant cognitive disabilities can demonstrate knowledge in a content area. The instructional strategies in Figure 1 can be used to support students learning specific tasks and to ensure strong learning outcomes.

Recognizing the need to make an instructional change is different than having the skills to do so.

Changes to the Content

The amount of information presented to the student can change to increase or decrease complexity. For example, the length of a passage can be increased from words to sentences to paragraphs or students can be taught to distinguish between using all of the information presented versus the need to eliminate extraneous information (e.g., Bill had four roses. *They were red*. Sue gave him three more roses. How many roses does Bill have in all?). Common aids for students with moderate to severe intellectual disabilities to reduce the complexity of the content are manipulatives and models within the context of math instruction (Browder, Spooner, Ahlgrim-Delzell, Wakeman, & Harris, 2008). For example, Mrs. Lee's students may need visuals to address how to add fractions, particularly when the types of fraction change (e.g., the introduction of sixths or eighths within questions after several lessons using halves or fourths).

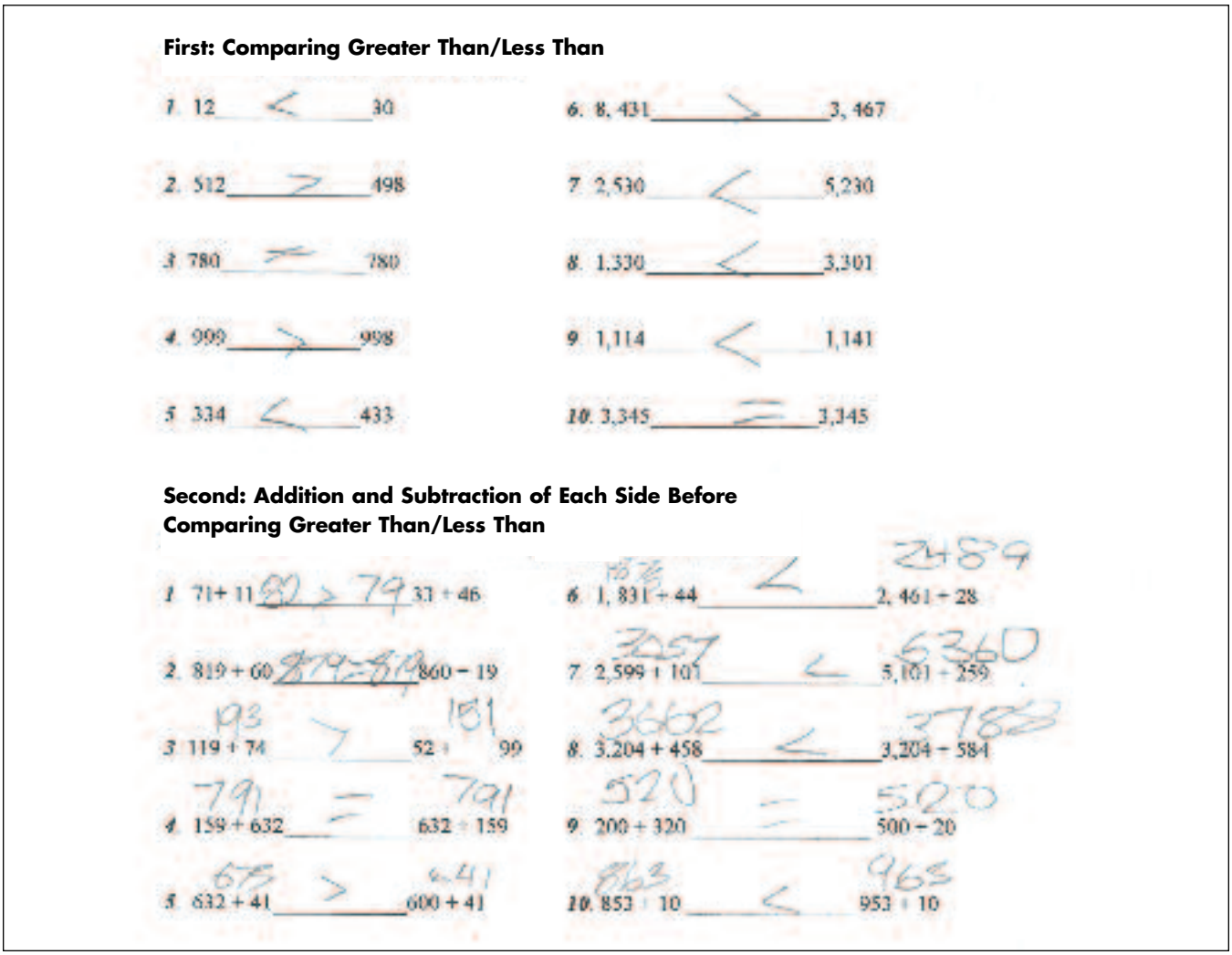
Figure 1. Strategies for Making Changes to Instruction



Students may use visuals that can be manipulated before they are expected to perform addition with numeric symbols only; for example, presenting circles partitioned into sixths with cutouts of 1/6 that can be manipulated would allow a student to use the support to physically combine 1/6 + 3/6 on a circle. The introduction of supports or models, however, may represent an increase to the amount of information presented to the students. Although in most instances, supports and models are designed to help students better understand or engage in the content, teachers must recognize the possibility that increased information may add to the performance expectations or cognitive demand placed upon students. For some students, adding to many models can even cause confusion instead of clarity.

Similarly, the number of steps to solve a problem can easily change. Students can move from needing a single step to find an answer to solving a multistep problem or, vice versa, backing down the number of steps if the task is too difficult. For example, teachers can explicitly teach the steps and support students using a task analysis (TA), with picture supports if needed, for a task such as long division or outlining a text for main idea and supporting details. Figure 2 provides two views of how teachers could increase the number of steps required to solve a problem while keeping the outcome a similar type of response. In the figure, the student is first asked to compare three- and four-digit whole numbers and to identify which is greater than, less than, or equal to. In the second part of the figure, the student first added or subtracted the two numbers on each side of the expression and then made the comparison of greater than, less than, or equal. The steps to eventually make the comparison can increase with the expectation of adding or subtracting each side. Mrs. Lee may need to present the steps within the TA individually or in a chained sequence rather than as a total task (Spooner et al., 2011). Students with moderate to severe intellectual disabilities likely need this breakdown to avoid being overwhelmed by too many concepts and performance expectations at one time. Mrs. Lee can begin by asking students to perform one of the final steps of adding fractions—when provided with denominators in the answer, students can combine the numerators and write or place totals into the answer. Students can then work to increase performance of the number of steps of the task in the chain toward the performance of the total task (an increase in the cognitive load).

Figure 2. Example of How to Increase the Number of Steps to Solve Problem

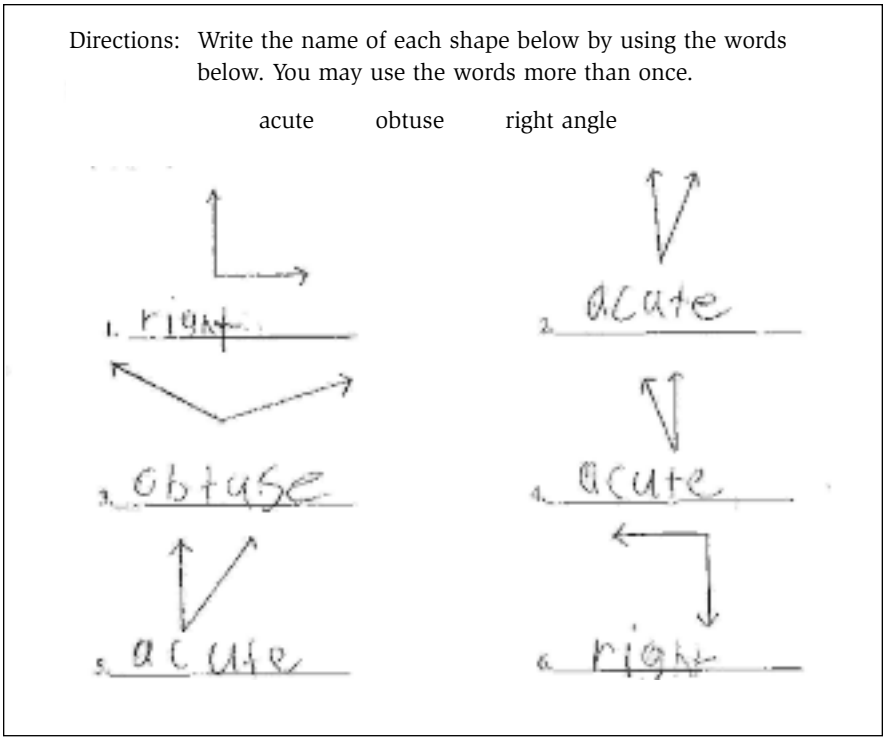


Students with significant cognitive disabilities may need several lessons to fully address a content standard. One change that may occur within planning and instruction is determining the proximity of the lesson content to the identified content standard. Although it may be necessary to start with a lesson that addresses only part of the content standard (such as addition of whole numbers or identification of what the parts of a fraction represent for Mrs. Lee's students), implementing a series of lessons that collectively approach the full range of the content standard provides students with opportunities to learn new information. Figure 3 provides an example of student work that represents part of the content standard. The standard covers both identifying and describing angles. Although identifying angles is part of the content standard, this work represents only a partial match. Further lessons would require the student to provide a description of how they were able to identify the angle (e.g., this angle is 90 degrees, which makes it a right angle).

Another way to change instruction is the abstractness of the materials presented to or used by the student. Pairing text with all symbols or materials presented is essential to allow students to develop and evolve in their symbol use. Materials range in abstractness, from object (paired with picture symbols and text); to photographs (paired with picture symbols and text); to picture symbols, sketches, or line drawings (paired with text); to text only. Many students with moderate or severe intellectual disabilities are to some degree picture symbol and text users (Towles-Reeves, Kearns, Kleinert, & Kleinert, 2009). Instruction should be designed to encourage the development of symbolic language whenever possible (Browder, Ahlgrim-Delzell, Courtade-Little, & Snell, 2006). Figure 4 shows one student's work in Grades 3 and 4. The addition problems evolve from the inclusion of picture supports with symbols to symbols only. The pictures offer additional information (a previously described change) that provides 1:1 representation for the numeric symbols. Students who are building their understanding of symbols can rely on the support of the pictures to reduce the abstractness of the numerals alone.

Additionally, technology can be used to present content to students to allow for more interaction and to potentially incorporate materials that can be manipulated. Technology can

Figure 3. Example of Student Work With a Link to the Content Standard "Identify and Describe Acute, Obtuse, and Right Angles"



be categorized as high-tech, such as interactive whiteboards and most assistive technology devices, or low-tech, such as videos. There are numerous studies using high- and low-tech devices to facilitate academic and social change for students with disabilities (e.g., Brunvand & Byrd, 2011; Carnahan, Basham, & Musti-Rao, 2009). A significant body of research on computer-assisted instruction and its use to increase interaction of students with significant cognitive disabilities with the instructional content is available (e.g., Ayres, Maguire, & McClimon, 2009; Pennington, Jones-Ault, Schuster, & Sanders, 2010). Mrs. Lee could incorporate high-tech devices such as an interactive whiteboard or computer software programs within the lesson to allow students to manipulate symbols and materials. These technologies could better support student visualization of the fractions. She could provide YouTube videos that offer supplemental instruction so students could stop, start, and replay as needed. Additionally, Mrs. Lee could incorporate low-tech devices, such as magnetic fraction strips on a cookie sheet, to keep materials in place for student computation. Or she could provide a specialized ruler with different layers that can measure two or more fractions at the same time. Technology may also increase the depth of knowledge within instruction (e.g., change from identify to demonstrate with the technology).

Another consideration for change during instruction relates to the complexity of responses or how the responses are made. One way to plan for change within response options is to consider the plausibility of the distractors, which has been well documented within the test development literature (e.g., Kubiszyn & Borich, 2000; Linn & Miller, 2005; Nitko, 2004). For example, if a student is asked to identify the solution to an addition problem that contains fractions, the distractors may first begin very disparate or unreasonable for the question being asked (e.g., "apples" or "4/6"). Next, the options can shift to be numbers but still quite implausible for the question being asked (e.g., "77" or "4/6"). Finally, the options can increase in number, including information from within the problem and/or providing more plausible answers to the question (e.g., "1/6," 3/6," or "4/6").

A second way to consider change within the way students respond is to consider the structure for how the response is made. The plethora of research on the use of graphic organizers with students with learning disabilities can be useful (e.g., Dexter & Hughes, 2011; Kim, Vaughn, Wanzek, & Wei, 2004). Graphic organizers can certainly facilitate how students with moderate and severe intellectual disabilities respond too. There are numerous resources for using graphic organizers (see box, "Sources for Sample Graphic Organizers"). Mrs. Lee could use a graphic organizer to help set up the fraction problems for the students so that space is available for students to draw or place tiles for the number in the numerators directly beside each numerator. Using familiar organizers allows students to generalize a process regardless of the numbers in the equation. This technique in turn could help students use fewer supports, increase student independence to solve problems, and develop a deeper understanding of the content.

Teachers must make decisions about the need and benefit of teaching the same content over multiple years as opposed to embedding the content yet to be learned within the context of grade-level content whenever possible (new learning versus the same content over time). In all content areas it is necessary to find a balance of both. Students with moderate to severe disabilities cannot afford to be taught the same content year after year with little to no new standards being presented. Whenever possible, embedding critical previous grade-level content within the instruction of current grade-level content is recommended. Teachers can collect data on both sets of skills or concepts to document student progress. For Mrs. Lee, one issue the students could be encountering is the lack of symbol recognition within the fraction. The students may not have 1:1 correspondence to count the visual supports or manipulatives. By embedding reviews of the numeral symbols and counting for her students during

instruction, Mrs. Lee can cover content not previously mastered in the context of learning new material.

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Changes in the Student's Performance

The number of responses the student is required to make may or may not be tied to the number of problems or questions or be evidence of mastery of a standard. Knowing when a student has learned the concept or skill or has the ability to do the task is the most important information. Questions Mrs. Lee can ask include:

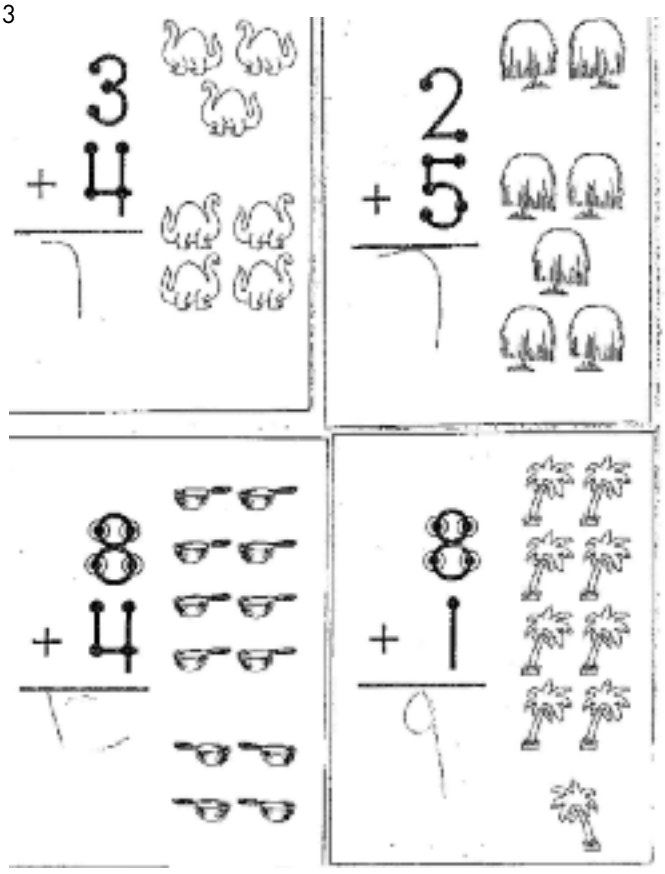
- What is the optimal criterion for success for the student to show mastery of the skill?
- How many times does a student have to demonstrate the skill for the teacher to be sure learning has occurred and that the student is not guessing?
- At what point do additional observations stop providing meaningful information?

Throughout any instruction, data-based decision making is necessary to determine both how many questions are enough and the necessary mastery to benchmark criteria for individual students (Browder, Spooner, & Jimenez, 2011), but is even more important with newly sequenced standards for students with severe cognitive disabilities. Once Mrs. Lee's students reach the mastery criteria for a skill or task, she will want to move that skill to a maintenance and/or generalization schedule. One of the issues that might be contributing to Mrs. Lee's students' behaviors may be boredom by the students. If students are able to perform the task consistently for a period of time, Mrs. Lee may need to change the skill (e.g., after 3 days of meeting the

Figure 4. Example of the Change in Abstractness of Materials Within Student Work From Grade 3 to Grade 4

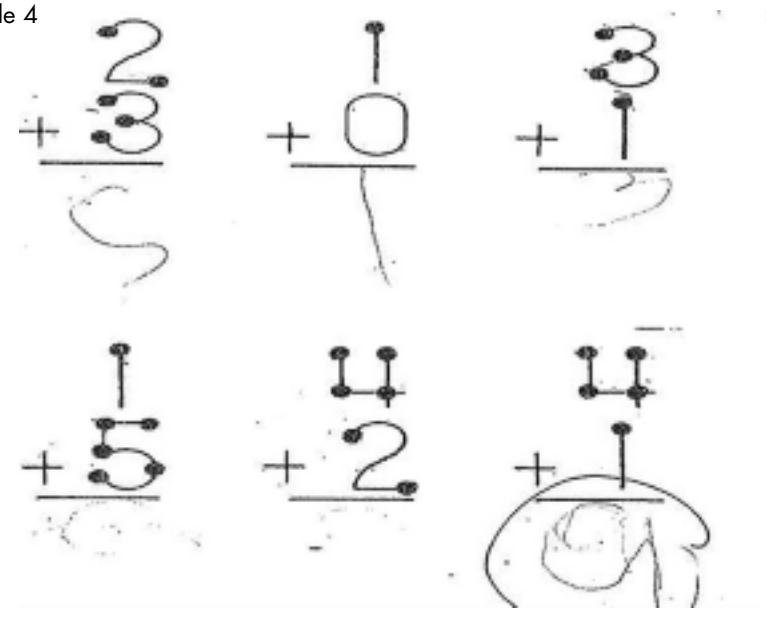
Student Work of TouchMath® With Visual Support

Grade 3



Student Work of TouchMath Without Visual Support (More Abstract)

Grade 4



Note. © TouchMath. Used with permission.

Sources for Sample Graphic Organizers

edHelper.com
http://www.edhelper.com/teachers/graphic_organizers.htm

National Center on Accessible Instructional Materials
http://aim.cast.org/learn/historyarchive/backgroundpapers/graphic_organizers
http://aim.cast.org/learn/historyarchive/backgroundpapers/graphic_organizers_udl

The Graphic Organizer
http://www.graphic.org

National Dissemination Center for Children With Disabilities
http://nichcy.org/schoolage/effective-practices/meta80resources

benchmark criterion for adding fourths, begin to teach adding sixths and eighths while reviewing fourths in warm-up questions).

Setting a target of reduced prompts and increased progress toward independence is best practice for any student.

Within each skill or task, students are asked to perform at various levels of depth of knowledge (DOK) using the content. Using one of the existing cognitive taxonomies such as Revised Bloom's Taxonomy (Anderson & Krathwohl, 2001), teachers can design instruction to increase student performance using newly acquired knowledge. The content may not change, but the student's level of understanding and application of content can. For example, a task can incorporate various objects addressing the concept of weight. Students could first be asked to identify the heavier object between a feather and a rock, a pencil and a chapter book, and an eraser and a pair of scissors. Each set of objects gets a little closer in weight to ensure the students have grasped the concept and are able to correctly label the heavier object. To extend this understanding, students could then be asked to measure each object to determine its weight and put them in order of increasing weight using a can of tuna fish, a jar of spaghetti sauce, and a bottle of water. This extends the concept of weight by asking students to measure the weight and then order a series of objects—a different level of performance.

Students can also be asked to do different things with the content such as generalize to novel situations or problems or develop deeper understanding of the concepts. As students are introduced to a concept, teachers must spend time ensuring students understand and are able to perform the knowledge and skills necessary within the learning sequence. For this example of adding fractions, there are two things to review: the concept of addition as the combination to increase an amount and the structure of a fraction, including what each part represents in regards to the whole. Building on or reviewing the skills and knowledge necessary within a learning sequence is time well spent by the teacher. Mrs. Lee may need to back up and address both of these concepts to ensure students are ready to go deeper and do more with these two concepts in tandem. Additionally, the generalization of newly developed skills in authentic contexts is necessary whenever possible. Collins, Karl, Riggs, Galloway, and Hager (2010) described such a situation in which students generalized academic skills learned in functional contexts such as meal preparation and healthy lifestyle choices. Mrs. Lee has already begun to think how students can generalize skills to novel situations (e.g., recipes) that provide a meaningful context for the students.

Setting a target of reduced prompts and increased progress toward independence is best practice for any student. The number or type of prompts required to answer a question can be reduced over time, as the student works with the same content. Most-to-least intrusive and least-to-most intrusive prompting requires a change within the prompt hierarchy (e.g., physical to model/gestural to verbal prompts to independent responding; Spooner et al., 2011). Students working on skills that follow a task analytic format can demonstrate change by completing more steps independently over time. Teachers must plan to promote student movement to a lesser prompt level whenever possible. Mrs. Lee will need to carefully review her data to determine (a) if a prompting system should be implemented to support student achievement or, (b) if a prompting system is already in place for the students, if there is a need to increase the prompting level if the students are unable to accurately perform steps within a task independently, and then work toward independence as students develop understanding.

Final Thoughts

This article supports teachers' ability to adjust how they will deliver instruction to effectively respond whenever students are not experiencing success. Most educators can change and adapt learning for students with moderate and severe intellectual disabilities based upon data as soon as there is recognition for the need to change instruction and as long as they have the content knowledge and instructional strategies to do so. Considering how the content and response options are provided and thinking about the expectations for students' performance can help special education teachers overcome challenging situations and get students with moderate or severe intellectual disabilities back on track with their learning.

References

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives* (abridged ed.). New York, NY: Longman.

Ayres, K. M., Maguire, A., & McClimon, D. (2009). Acquisition and generalization of

chained tasks taught with computer-based video instruction to children with autism. *Education and Training in Mental Retardation and Developmental Disabilities*, *44*, 493–508.
Browder, D., Ahlgrim-Delzell, L., Courtade-Little, G., & Snell, M. (2006). General curriculum access. In M. E. Snell & F. Brown (Eds.), *Instruction of students with severe disabilities* (6th ed.; pp. 489–525). Upper Saddle River, NJ: Pearson.
Browder, D. M., Jimenez, B. A., & Trela, K. (2012). Grade-aligned math instruction for secondary students with moderate intellectual disability. *Education and Training in Autism and Developmental Disabilities*, *47*, 373–388.
Browder, D. M., Spooner, F., Ahlgrim-Delzell, L., Wakeman, S. Y., & Harris, A. (2008). A meta-analysis for teaching mathematics to individuals with significant cognitive disabilities. *Exceptional Children*, *74*, 404–432.
Browder, D. M., Spooner, F., & Jimenez, B. (2011). Standards-based IEPs and progress monitoring. In D. Browder & F. Spooner, (Eds.), *Teaching students with moderate and severe disabilities* (pp. 42–91). New York, NY: Guilford Press.
Brunvand, S., & Byrd, S. (2011). Using voicethread to promote learning engagement and success for all students. *TEACHING Exceptional Children*, *43*(4), 28–37.
Carnahan, C., Basham, J., & Musti-Rao, S. (2009). A low-technology strategy for increasing engagement of students with autism and significant learning needs. *Exceptionality*, *17*, 76–87. http://dx.doi.org/10.1080/09362830902805798
Collins, B., Karl, J., Riggs, L., Galloway, C. C., & Hager, K. D. (2010). Teaching core content with real-life applications to secondary students with moderate and severe disabilities. *TEACHING Exceptional Children*, *43*(1), 52–59.
Courtade, G. R., Browder, D. M., & Spooner, F. (2010). Training teachers to use an inquiry-based task analysis to teach science to students with moderate and severe disabilities. *Education and Training in Autism and Developmental Disabilities*, *45*, 378–399.
Dexter, D. D., & Hughes, C. A. (2011). Graphic organizers and students with learning disabilities: A meta-analysis. *Learning Disabilities Quarterly*, *34*(1), 51–72.
Hampshire, P. K., Butera, G., & Bellini, S. (2011). Self-management and parents as interventionists: Improving homework performance in middle school students with disabilities. *Beyond Behavior*, *21*(1), 28–35.
Kim, A., Vaughn, S., Wanzek, J., & Wei, S. (2004). Graphic organizers and their effects on the reading comprehension of students with LD: A synthesis of research. *Journal of Learning Disabilities*, *37*, 105–118.
Kubiszyn, T., & Borich, G. (2000). *Educational testing and measurement* (6th ed.). New York, NY: Wiley & Sons.
Lee, G. T., & Singer-Dudek, J. (2012). Effects of fluency versus accuracy training on endurance and retention of assembly tasks by four adolescents with developmental disabilities. *Journal of Behavioral Education*, *21*(1), 1–17. http://dx.doi.org/10.1007/s10864-011-9142-9
Linn, R. L., & Miller, D. (2005). *Measurement and assessment in teaching* (9th ed.). Upper Saddle River, NJ: Prentice Hall.
Nitko, A. J. (2004). *Educational assessment of students* (4th ed.). Upper Saddle River, NJ: Prentice Hall.
Pennington, R. C., Jones Ault, M., Schuster, J. W., & Sanders, A. (2010). Using simultaneous prompting and computer-assisted instruction to teach story writing to students with autism. *Assistive Technology Outcomes and Benefits*, *7*, 24–38.
Spooner, F., Browder, D., & Mims, P. (2011) Evidence-based practices. In D. Browder & F. Spooner (Eds.), *Teaching students with moderate and severe disabilities* (pp. 92–122). New York, NY: Guilford Press.
Towles-Reeves, E., Kearns, J., Kleinert, H., & Kleinert, J. (2009). An analysis of the learning characteristics of students taking alternate assessments based on alternate achievement standards. *Journal of Special Education, 42*, 241–254.
Wakeman, S. Y., Karvonen, M., & Flowers, C. (2013). *Dimensions of change: Academic content for students with significant cognitive disabilities*. Cullowhee, NC: Project LEAAP, Western Carolina University.

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