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Curriculum Augmentation and Adaptation Strategies to Promote Access to the General Curriculum for Students with Intellectual and Developmental Disabilities

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Abstract: Curriculum modification strategies, particularly curriculum adaptations and augmentations, have been identified as important to enable learners with disabilities to achieve access to and progress in the general curriculum. There is, however, relatively little research on the effect of these strategies with students with intellectual and developmental disabilities. The purpose of this paper is to examine curriculum adaptation and augmentation strategies that might promote student involvement and progress in the general curriculum for students with intellectual and developmental disabilities, and to provide recommendations with regard to how such augmentations might be modified to be more appropriate for use with this population.

More than five years after the 1997 amendments to IDEA first required that the IEPs of all students receiving special education services describe how a child's disability affects his or her involvement with and progress in the general curriculum and provide statements concerning measurable goals, services, and program modifications to achieve such involvement and progress, there are still too few frameworks that describe strategies to address "access to the general curriculum" for *all* students with disabilities, *particularly* students with intellectual and developmental disabilities. Many educators working with students with more severe disabilities are dubious that the focus on access is either achievable or advisable. Agran, Alper, and Wehmeyer (2002) conducted a survey of teachers working with students with severe disabilities about their perceptions of the IDEA access requirements. When asked if ensuring students' access to the general curriculum would help *increase educational expectations* for students with severe disabilities, 75% of teachers agreed to some degree. However, 63% indicated they felt access to the general education curriculum was *more* important for students with mild disabilities. While between 11% and 23% of respondents indicated they used several different ways to ensure some level of access, the largest proportion (37%) indicated that students with severe disabilities were receiving an educational program developed outside the context of the general curriculum. Nearly ¾ of respondents indicated that their students with severe disabilities were evaluated exclusively by criteria stipulated in the IEP. The majority of teachers (85%) indicated that students with severe disabilities should not be held to the same standards as students without disabilities, and over half (53%) reported their school district had no clear plan for ensuring access to the general curriculum for students with severe disabilities.

Such skepticism might, rightfully, be linked to the lack of concrete strategies forwarded to enable students with more severe disabilities to access the general curriculum. The lack of focus on access for this population is, however, slowly diminishing. Researchers and policymakers have proposed models to promote access for this population (Janney & Snell, 2000; Wehmeyer, Lance, & Bashinski, 2002), addressed issues concerning how to ensure an appropriate education within the

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context of the access mandates (Browder, Flowers, Ahlgrim-Delzell, Karvonen, Spooner, & Algozzine, 2004; Kochhar-Bryant, & Bassett, 2002; Wehmeyer, Field, Doren, Jones, & Mason, 2004; Wehmeyer, Sands, Knowlton, & Kozleski, 2002), and conducted research examining factors contributing to access for students with intellectual and developmental disabilities (Palmer, Wehmeyer, Gipson, & Agran, 2004; Wehmeyer, Lattin, Lapp-Rincker, & Agran, 2003).

A topic of virtually all discussions concerning access for students with disabilities involves the centrality of curriculum modifications to this effort (Fisher & Nancy, 2001; Janney & Snell, 2000; Kame'enui & Simmons, 1999; Nolet & McLaughlin; 2000; Wehmeyer, Sands et al., 2002). Wehmeyer and colleagues (Knowlton, 1998; Wehmeyer, Lance et al., 2002; Wehmeyer, Lattin, & Agran, 2001; Wehmeyer, Sands et al., 2002) proposed a multilevel model to promote access for students with intellectual disabilities that involved three levels of curriculum modification: curriculum adaptations, augmentations, and alterations.

Curriculum adaptations refer to efforts to modify the way in which content is represented or presented or in which the student engages with and responds to the curriculum, including the implementation of features of Universal Design for Learning (Rose & Meyer, 2002; Wehmeyer, Lance et al., 2002). Curriculum augmentations refer to efforts to augment or expand the curriculum to provide students with additional skills or strategies that enable them succeed within the general curriculum. Curriculum alterations refer to the addition of content specific to a student's needs, including functional skills or life skills not found in the general curriculum.

In observational studies of the degree to which these levels of curriculum modification were in place to support students with intellectual disabilities, Wehmeyer, Lattin et al. (2003) and Soukup, Wehmeyer, Bashinski, and Bovaird (2004) found that a few instances of curriculum *adaptations* were implemented, while no instances of the use of curriculum *augmentations* with this population were noted. These curriculum modification strategies are fundamental in efforts to promote progress in the general curriculum for students with other disabilities, particularly, students with learning disabilities (Deshler, Schumaker, Harris, & Graham, 1999; Kame'enui & Simmons, 1999; Lenz, Deshler, & Kissam, 2003; Scruggs & Mastropieri, 2000). Most of the focus in curriculum adaptations for students with more severe disabilities has been on the promising role technology can play in providing universally-designed materials (Rose & Meyer, 2002; Wehmeyer, Lance et al., 2002). There has, however, been relatively little research on potential curriculum adaptation and augmentation strategies that might support students with intellectual and developmental disabilities.

The purpose of this paper is to examine curriculum adaptation and augmentation strategies that might promote involvement and progress in the general curriculum for students with intellectual and developmental disabilities, and to provide recommendations with regard to how such adaptations and augmentations might be modified to be more appropriate for use with this population.

Curriculum Augmentation and Adaptation Strategies

Learning Strategies

Cognitive or learning strategies provide students with strategies that enable them to engage the learning process more effectively (Rosenthal-Malek & Bloom, 1998). There are a variety of such learning strategies (including shadowing, verbatim notes, graphic or advance organizers, semantic maps, mnemonics, chunking, questioning, and visualizing strategies), that fall under the category of curriculum adaptations or augmentations, all of which have been validated with students with learning disabilities and some of which might benefit students with intellectual or developmental disabilities (Rosenthal-Malek & Bloom). The following brief overview highlights those strategies that might warrant closer scrutiny with this population.

Graphic Organizers

Graphic organizers are "visual displays teachers use to organize information in a manner

that makes the information easier to understand and learn" (Meyen, Vergason, & Whelan, 1996, p. 132). They involve efforts to structure information or arrange important aspects of a concept or topic into a pattern using graphic modalities (Bromley, Irwin-DeVitis, & Modlo, 1995), and thus are curriculum adaptations (e.g., modifying content representation or presentation). Graphic organizers are effective in enabling students to assimilate new information by organizing previous information. Flow charts, semantic maps, webs, and Venn diagrams are all examples of graphic organizers.

A number of studies with students with learning disabilities have validated the efficacy of graphic organizers in improving text and reading comprehension (Alvermann, Boothby, & Woolfe, 1984; Barron & Schwartz, 1984; Bos & Anders, 1992; Griffin, Simmons, & Kame'enui, 1991; Moore & Readence, 1980; Simmons, Griffin, & Kame'enui, 1988). In addition, graphic organizers have been effectively applied across other content areas, such as science, math, and social studies (Amstrong, 1993; Griffin et al.; Guastello, Beasley, & Sinatra, 2000; Hanselman, 1996). Visually displaying key content ideas can especially benefit students who struggle with organizing information (Fisher & Shumaker, 1995). In addition to improving student learning, graphic organizers have been shown to be useful in building relationships between students by sharing personal information such as hobbies, dreams, family and experiences with other students through "me maps" (Cullinan, Galda, & Strickland, 1993). Graphic organizers also can be applied at the whole-class level (Baxendell, 2003).

The limited number of research studies on the efficacy of the use of advance (though not specifically graphic) organizers with students with intellectual disabilities provided mixed results. Peleg and Moore (1982) found that when students with mild mental retardation were instructed using an advance organizer (either oral or written), the oral organizer seemed detrimental to learning while the written organizer led to a higher mean questions answered, although the latter did not reach significance. Subsequent research was more encouraging. Reis (1986) found that advance organizers in the form of knowledge statements (defines certain concepts in the content in advance), and purposive statements (provides students with a description of what he or she was supposed to listen for in particular) improved comprehension performance of students with and without intellectual disabilities (group), with all students performing better in the knowledge plus purpose statements condition than in all other conditions (knowledge statement only, purpose statement only, no advance organizer). Both the knowledge statement only and the purpose statement only conditions, however, were more positive than the no advance organizer condition. There were group differences in comprehension scores (e.g., students without intellectual disabilities answered, on the average, more questions than students with intellectual disabilities), but there were no group by treatment effects, indicating that students with intellectual disabilities received equivalent benefit from using the advance organizer. Similarly, Chang (1986) found that the use of an advance organizer prior to viewing a film facilitated comprehension for students with and without intellectual disabilities, with no differential effect based on disability (e.g., students with intellectual disabilities benefited as much from the advance organizers as students without intellectual disabilities).

The limited number of studies examining the potential utility of graphic or advance organizers for students with intellectual disabilities provides only limited information about their viability with this population, but given this strategy's prominence in the field of learning disabilities as an effective way to adapt the representation and presentation of curriculum content, it is important to consider this approach more seriously. Moreover, there have not been extensive efforts to examine what types of graphic organizers might be effective for this population (other than to suggest that oral or verbal organizers may not be the best means) and how modifications to more traditional graphic or advance organizers might have efficacy for students with intellectual and developmental disabilities. Specifically, the use of computer-based technologies provides newer and potentially more powerful ways, through features such as multimedia presentation of 'big ideas,' to provide graphic organizers for all students and particularly for students with intellectual disabilities.

Chunking

The definition and strategies for *chunking* vary somewhat depending on the content areas or contexts in which this strategy is used. However, chunking is basically the process of "combining related elements into units" (Sylwester, 1995) that are manageable to students. Chunking is a curriculum augmentation strategy in that students learn to 'chunk' material to make it more manageable and to improve memory and recall. Chunking has been used as a teaching device in content enhancement for students with learning disabilities (Bulgren & Lenz, 1996). Chunking is especially effective in improving skills related to language arts, such as reading (Cortese, 2003; Silliman, Bahr, Beasman, & Wilkinson, 2000; Vogt & Nagano, 2003), word recognition (Morris, Bloodgood, Lomax, & Perney, 2003), verbal recall (Montgomery, 2002), spelling (by chunking letter and matching sounds) (Dahl et al., 2003), fluency and comprehension (Vaughn et al., 2000) and writing (Short, Kane, & Peeling, 2000).

In addition to its efficacy with students with learning disabilities, chunking has been shown to be effective in improving word analysis, reading, and recall information for students who are English language learners, students with attention-deficit-hyperactivity disorder, and gifted students (Gallagher, 1994; Linan-Thompson, Vaughn, Hickman-Davis, & Kouzekanani, 2003; Schwiebert, Sealander, & Dennison, 2002). Moore and Brantingham (2003) taught a student with reading difficulties to study his own miscues to improve his reading through Retrospective Miscue Analysis (RAM), which incorporated chunking as one strategy. Sentence by sentence self-monitoring (SSSM), which included a chunking strategy, was also effective in enabling students to be active readers by internalizing self-monitoring (Buettner, 2002). In addition, chunking was used to help students with academic and behavior problems succeed in school by enabling them to learn social and self-management skills, including specific cognitive skills such as "chunking key ideas into small groups" (Brigman & Campbell, 2003). Across virtually all of these studies, direct instruction to teach the student the chunking strategy is necessary for the students to utilize and benefit from the strategy (Short et al., 2000).

While there is much research that focuses on the effect of chunking for students with learning disabilities, struggling readers, and young emergent readers, there is little research for students with intellectual disabilities. One outcome of standards-based reform efforts through the *No Child Left Behind* Act and the IDEA *Access to the General Curriculum* mandates has been to focus more attention on teaching students with intellectual disabilities to read (Browder & Spooner, in press). Based on this strategy's utility in improving reading and language arts outcomes for students with other disabilities and given the strategy's close links with self-management strategies, which have been shown to be effective with this population, it would seem worthwhile to examine the efficacy of this strategy with students with intellectual and developmental disabilities. Given the well-documented difficulty students with intellectual and developmental disabilities have with memory, chunking might be a useful means to enhance attention and memory by enabling them to chunk related parts into units that are meaningful to them. Combining chunking strategies with other strategies, such as graphic organizers, and using the capacity of technology may make the strategy more accessible for students with intellectual and developmental disabilities. Using chunking with other visual stimuli or cues could facilitate a student's attention to and memory about specific chunks. In addition, chunking could be a bridge between teacher-directed teaching and student-directed learning strategies by gradually fading teachers' direct instruction and empowering students to be more active learners.

Mnemonic Strategies

Mnemonic strategies are systematic procedures for enhancing memory by providing effective cues for recall as a "cognitive cuing structure" such as word, sentence, or picture devices (Bellezza, 1981; Lombardi & Butera, 1998). This strategy is used mainly in developing better ways to encode new information for easier retrieval (Mastropieri & Scruggs, 1998). Mnemonic strategies are commonly divided into imagery illustrations, such as pictures or

diagrams, and word-based devices, using words to aid memory (Access Center, 2003; Mastropieri & Scruggs, 1991; Daniel & Pressley, 1987). It is more effective, however, to integrate imagery illustration and word-based devices as opposed to using them separately.

Many studies have documented the efficacy of mnemonic strategies with students with learning disabilities and mild intellectual disabilities. Such strategies can: be used across multiple content areas, such as language arts, mathematics, science and social studies (Mastropieri & Scruggs, 1988, 1991; Scruggs & Mastropieri, 2000); be used across age ranges, from first-grade to adolescence or adulthood (Fulk, Lohman, & Belfiore, 1997; Scruggs & Mastropieri); be used for behavioral interventions, including self- management and positive behavior support (Agran, King-Sears, Wehmeyer, & Copeland, 2003; Silverstein, 1997; Smith, Siegel, O'Connor, & Thomas, 1994); be a tool for other curriculum modification strategies such as cognitive mapping, computer-assisted instruction, and self-monitoring or self-instruction (Boyle & Yeager, 1997; Brown & Frank, 1990; Irish, 2002); and can be effectively applied to the classroom level for access to the general curriculum (Ashton, 1999; Mastropieri, Scruggs, & Whedon, 1997; Mastropieri & Scruggs, 1998; Munk, Bruckert, Call, Stoehrmann, & Radandt, 1998).

The general potential of mnemonic strategies can be extended to benefit a wider range of students, including students with intellectual and developmental disabilities, in several ways. Research has found that students with intellectual disabilities "show increased learning and memory when the content is presented in meaningful contexts" (Taylor & Turnure, 1979, p. 660). Mnemonic strategies provide a means for students to overlay context meaningful to them in situations that might otherwise not be the case. Mnemonic strategies can tap areas of potential cognitive strength (memory for pictures, acoustic memory) for students with intellectual impairments, while de-emphasizing relative weakness (Scruggs, Mastropieri, & Levin, 1987) and enable students to learn new skills or information in a way that is more meaningful to them through acoustic-imaginal linking (Mastropieri, Scruggs, & Levin, 1985). In addition, mnemonic strategies have been used for addressing problem behavior, which is often a barrier to access to the general curriculum for students with intellectual and developmental disabilities (Carpenter, 2001). Mnemonic strategies are used in this manner in two ways: (a) by being infused into student-directed learning strategies, such as problem solving, self-instruction, and self-monitoring, through keyword or letter strategy mnemonics based on imagery or acoustic linking strategies (Silverstein, 1997; Smith et al., 1994), and (b) by being infused into positive behavior support models by arranging antecedent events of the behavior problem or by providing appropriate support to replace the function of the behavior problem through a visual card or social mnemonic strategy (Agran et al., 2003).

Another potential for mnemonic strategies is that they can be applied to different levels of curriculum modifications. For example, keyword and letter methods (e.g., using acronyms) through visual images or sketches can be applied as a curriculum adaptation (Bulgren & Lenz, 1996) by being incorporated into graphic organizers. Moreover, students can be taught to generate their own mnemonic strategies, including keyword strategies, rhymes, or acoustic linking strategies that, in turn, involve a curriculum augmentation strategy (Wehmeyer et al., 2001). Mnemonics also contribute to the efficacy of other curriculum augmentation strategies, such as student-directed learning strategies (Agran et al., 2003; Smith et al., 1994; Wehmeyer, Sands et al., 2002).

Student-Directed Learning Strategies and Self-Determination

Student-directed learning strategies form a subset of broader learning or cognitive strategies, and represent a powerful means to augment the curriculum to enable students with intellectual and developmental disabilities to perform more effectively in the general curriculum (Wehmeyer et al., 2001). Moreover, promoting and enhancing self-determination and its component elements (goal-setting, problem-solving, self-regulation and other skills) equips students with disabilities with skills that, in turn, will enable them to succeed in the general curriculum (Wehmeyer et al., 2004). Student-directed learning strategies

(Agran et al., 2003) enable students to learn to direct their learning and self-regulate problem solving geared toward learning (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000). Teaching students strategies such as antecedent cue regulation, self-instruction, self-monitoring, self-evaluation, and self-reinforcement has multiple benefits, including promoting inclusion and self-regulated learning (Agran et al., 2003). There is now a fairly robust body of literature documenting the impact of promoting self-determination and student-directed learning on positive outcomes for children and youth with intellectual and developmental disabilities (Agran, et al., 2003; Algozzine, Browder, Karvonen, Test, & Wood, 2001; Wehmeyer, Abery, Mithaug, & Stancliffe, 2003), and an emerging database suggesting that such strategies result in enhanced access to the general curriculum (Palmer et al., 2004; Wehmeyer et al., 2004).

Goal-Setting

A critical component of self-determined behavior is goal-setting and attainment. Goal-setting involves: a) identifying and defining a goal, b) developing an action plan that consists of specific steps that will be undertaken in an effort to achieve the goal, and c) evaluating the outcomes of these actions (Locke & Latham, 1984, 1994). A goal is, in essence, a specification of what a person wishes to achieve through his or her actions. Goals act to regulate our actions (Locke & Latham, 2002). As an augmentation to the general curriculum, teaching students with intellectual and developmental disabilities to set and attain goals can enable them to better regulate their behavior as it relates to their academic progress by providing them with an established criterion in which to compare their current level of performance.

Research on the impact of goal-setting on academic performance has focused primarily on students with learning disabilities. This literature base indicates that goal-setting interventions have a positive impact on the academic performance of students across a variety of academic domains, including writing (Graham, MacArthur, Schwartz, & Page-Voth, 1992; Page-Voth & Graham, 1999; Troia & Graham, 2002), arithmetic (Schunk, 1985), and spelling and vocabulary evaluation (Gardner & Gardner, 1978). The goal-setting interventions that have been evaluated range from very simple goal-setting interventions, where a teacher or researcher simply asked students to state a performance goal prior to beginning an assignment or studying for a test (Gardner & Gardner; Schunk), to specific, structured strategies, such as Do PLANS (Pick goals, List ways to meet goals, And, make Notes, Sequence notes) (Graham et al.), STOP & LIST (Troia & Graham), or the SMG (Student Management Guide) (Lenz, Ehren, & Smiley, 1991).

Even though there is limited research about the impact of goal-setting on the academic performance of students with intellectual and developmental disabilities, goal-setting has promise to promote greater access to the general curriculum for this population. There is limited, though emerging, evidence that students with intellectual disabilities can be taught the skills necessary to set and achieve goals (Copeland, Hughes, Agran, Wehmeyer, & Fowler, 2002; German, Martin, Marshall, & Sale, 2000), although most of these evaluations have been with non-academic content areas (Copeland & Hughes, 2002). There is ample evidence, though, that students with intellectual and developmental disabilities can be taught to set goals that result in the attainment of educationally relevant objectives (Mithaug, Mithaug, Agran, Martin, & Wehmeyer, 2003; Wehmeyer, Abery, et al., 2003; Wehmeyer et al., 2000). As noted earlier, Palmer et al. (2004) taught middle school students with intellectual disabilities to set and attain goals linked to grade-referenced standards in the general curriculum, illustrating the potential role that promoting goal setting has in achieving access to the general curriculum for this population. Like other strategies, goal-setting also can be incorporated into other adaptation or augmentation strategies.

Problem-Solving

A second component element of self-determined behavior (Wehmeyer, 2001), problem-solving, also has promise to promote student access and progress in the general curriculum. Problem-solving is a process used to identify available information and design solutions to

a problem in order to achieve one's goal (Agran, Blanchard, Wehmeyer, & Hughes, 2002). Generally, four steps are involved in a traditional problem solving process: (a) identify the problem, (b) identify potential solutions to the problem, (c) identify barriers to solving the problem, and (d) identify consequences to each solution (Agran & Wehmeyer, 1999). Teaching problem solving is a critical element not only for ensuring students' success in general education (Agran, Blanchard et al., 2002), but also for school reform efforts (Gumpel, Tappe, & Araki, 2000; Peterson, 1996).

Teaching problem-solving skills has been used as a curriculum augmentation for students with learning disabilities. Such instruction forms the core of many strategic instruction activities validated with students with learning disabilities, focusing on the problem-solving aspects of using information or knowledge (Deshler, Ellis, & Lenz, 1996). Problem solving is an especially important skill for math (Gersten & Baker, 1998; Maccini & Hughes, 2000). Gersten and Baker demonstrated that problem-solving strategies were also useful for students with learning disabilities in learning science content.

Similar to goal-setting, there is evidence, albeit limited, that students with intellectual and developmental disabilities can learn to solve problems (Wehmeyer, Agran, Palmer, Mithaug, & Martin, 2003), including in the context of the general education classroom (Agran, Blanchard et al., 2002). While most of the research on problem solving with students with intellectual and developmental disabilities is related to non-academic content such as transition skills, workplace behaviors, and community and leisure activities (Agran, Blanchard, & Wehmeyer, 2000; Hughes & Rusch, 1989; O'Reilly, Lancioni, & Kierans, 2000), Palmer et al. (2004) showed that instruction in problem solving could enable students with intellectual and developmental disabilities to make progress in the general curriculum.

Again, integrating problem-solving into other augmentation strategies is an effective means to achieve more positive outcomes. For example, traditional methods of teaching self-instruction essentially teach students to articulate a problem-solving sequence (Hughes, Hugo, & Blatt, 1996). In addition, problem-solving can be incorporated into goal-setting as shown by research with the *Self-Determined Learning Model of Instruction* (Wehmeyer, Abery et al., 2003; Wehmeyer et al., 2000). Also, problem-solving can be used with technology. Mastropieri, Scruggs, and Shian (1997) demonstrated that students with mild mental retardation can learn mathematical problem-solving skills through a computer animation program. The students learned problem solving more effectively in computer-based learning modes than in paper-pencil based learning activities.

Table 1 provides a brief summary of the potential of each aforementioned strategy for students with intellectual and developmental disabilities and practical suggestions to apply the strategies in the classroom.

Conclusions

We would suggest that there is a need, given the impetus provided to the field by the IDEA *Access to the General Curriculum* mandates, to engage in research and model development to examine the efficacy of the strategies described above to support students with intellectual and developmental disabilities to become involved in and progress in the general curriculum, and to develop models that modify these strategies or create new strategies. As a first step, current studies on the effect of strategies for access for students with disabilities need to "shift gears" to some degree to focus research and model development that moves away from examining achievement only in non-academic content areas and moves toward examining outcomes in academic content areas, as well as move away from models that rely exclusively on external supports towards models that focus on the incorporation of curriculum augmentation strategies that enable students to more effectively teach themselves. In so doing, we believe, students with intellectual and developmental disabilities will be more effective in achieving access to and progress in the general curriculum.

TABLE 1

Potential of Curriculum Augmentation and Adaptation Strategies for Students with Intellectual and Developmental Disabilities and Suggestions for Application in Classroom

Strategies	*Potential/findings(*) for students with intellectual and developmental disabilities*	*Suggestions for applications in classroom*
Graphic organizer Types: Flow chart, Semantic maps, Webs, Computerized program	• Can be used as a curriculum adaptation and augmentation across various content areas. • Written organizer is more effective than oral organizer.* • Concisely introducing a purpose statement helps students' comprehension.* • Can be used to facilitate student participation through various group formats.	• Use written advance organizer to introduce purpose for a big ideas or class lesson. • Provide pictures or illustrations as a graphic organizer for students who are not good at reading. • Use graphic organizers as handouts for the class or homework that have students fill in blanks that are included in the graphic organizer. • Simplify graphic organizers by reducing complexity, clarifying symbols, and providing enough space. • Use graphic organizer as a small group activities to maximize student participation and interaction with other peers. • Use multimedia technology to extend the potential of graphic organizers.
Chunking	• Can be used as a curriculum adaptation and augmentation across various content areas. • Can be used for enhancing attention and memory for students. • Can be incorporated with other strategies, such as graphic organizers and self-management skills. • Should be taught directly, but gradually fading the teacher's intervention to enable students to be more active learners • Can be more effective when incorporated with visual cues and technology.	• Use chunking with graphic organizers to combine related elements into one unit. • For students who are not good at reading, use pictures and other visual cues. • Provide opportunities to chunk the student's favorite activities or goal related to the IEP by using pictures or photo. • Incorporate chunking with other self-directed learning strategies. • Gradually fade teacher-directed teaching to empower students
Mnemonic strategies Types: Imagery devices, Word-based devices (Keyword, Pegword, Letter method) Combining mnemonic devices	• Can meet individual needs based on characteristics of students with intellectual and developmental disabilities, including intelligence and adaptive behavior. ○ Are effective in learning and memorizing new information through memory for picture or acoustic memory that is cognitive*	• Identify familiar part from new information and provide visual cues related to them to provide new information in a meaningful way • Use antecedent cue regulation strategies, such as picture or auditory prompts to enable students to manage behavior in class. • Provide handout or worksheet including highlighted or colored keyword.

TABLE 1—(*Continued*)

Strategies	*Potential/findings(*) for students with intellectual and developmental disabilities*	*Suggestions for applications in classroom*
	○ Are effective in managing behavior including self-regulatory management and PBS* ● Can be applied to different levels of curriculum modification, adaptation, augmentation and alternation in non-academic context and in academic context*	● Incorporate mnemonic strategies to self-instruction (self-talk), problem-solving, and goal-setting. ● Modify/apply mnemonic strategies widely used below: ○ Keyword method ▪ As a starting point, enable students to recognize and remember keyword itself instead of new words that are related to the keyword ▪ Use keyword that is related to students' meaningful experiences or familiar environments. ▪ Incorporate keyword method to identify goal or problem ▪ Present or highlight the keyword with verbal cues and visual images, such as a card or photo, etc ○ Pegword method ▪ Incorporate pegword method to keyword method, as possible, instead of using it alone ▪ Infuse pegword into a familiar song or melody ○ Letter method ▪ Create a short question with a picture or visual card considering students' learning styles, needs and abilities with visual images, such as a card or photo, etc ▪ Teach self-instruction and problem-solving with a letter mnemonic to be practiced in meaningful classroom activities ▪ Present letter with visual cards and verbal cues
Goal-setting	● Can be used as a curriculum augmentation. ● Can be incorporated within problem-solving strategies. ● Students with intellectual disabilities can learn the skills necessary to set and achieve goals even though such skills are improved performance in non-academic domains (e.g., vocational and behavioral).* ● Can be used to motivate students by enabling them to set their own goal according to their preference. ● Can be used with visual structuring system.	● Provide clear purpose or objectives for class activities across various content areas ● Enable students to set a personal goals based on their preference and interests to motivate learning and increase engagement. ● Provide options or choices for students who are not good at expressing their own preference by using visual cues ● Enable students to participate in IEP meeting to understand their future goal in general classroom ● Use visual cues, graphic organizers or chunking to clarify priorities of target goal ● Provide the opportunity to set a goal for a class, with peers in small groups

TABLE 1—(*Continued*)

Strategies	*Potential/findings(*) for students with intellectual and developmental disabilities*	*Suggestions for applications in classroom*
Problem-solving	• Can be used as a curriculum augmentation. • Can be incorporated into goal setting. • Can be generalized across different class activities. • Enables students to reach their own goals, especially related to non-academic content such as transition and workplace skills, community and leisure activity.* • Is effective for students to achieve their goals in academic areas, such as following direction and class contribution.* • When combined with other strategies, such as self-instruction, is more effective.*	• Help students identify their own problems in academic areas by providing them with an opportunity to choose problems that are related to IEP goals. • Use pictures or other visual cues to help students express their opinions about problem or goal • Use a systematic learning program related to problem-solving such as *the Self-Determined Learning Model of Instruction.* • Incorporate self-instruction, self-monitoring and mnemonic strategies for effective learning of problem-solving. • Teach problem-solving skills in the natural context that students may face in regular routines. • Provide students with opportunities to choose a reward for solving the problem. • Enable students to solve problem with other peers in small group.

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