
Literacy Interventions for Young Adults with Intellectual and Developmental Disabilities in the Inclusive Postsecondary Education Settings: A Review of a Program of Research

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Many students with intellectual and developmental disabilities (IDD) enrolled in postsecondary education do not derive full benefits of attending college because of their limited academic skills. This review summarizes a series of experimental studies that investigated the effects of interventions that targeted reading and writing skills for young adults with IDD enrolled in an authentic postsecondary education setting. Results of the review suggest that young adults with IDD can benefit from explicit instruction and cognitive strategy instruction. Effective academic intervention should be adaptive to the diverse learning needs of the students while providing a scaffold that supports their motivation and their persistence.

Historically, young adults with IDD participated in community-based education programs that focused on vocational or functional life skills. With the passage of the Higher Education Opportunity Act of 2008, federal financial aid (e.g., Pell grants, work study) became available for students with IDD who attend community colleges and universities that have earned the designation of being a Comprehensive Transition Program (CTP). In addition to federal aid, CTP status creates an advising structure, housing opportunities, inclusive coursework/internships, and other supports for students with IDD. Postsecondary programs for individuals with IDD were also undergirded with the initial funding of 27 model demonstration Transition Programs for Students with Intellectual Disabilities (TPSID), a network of these programs, and a national coordinating center (Hendrickson, Carson, Woods-Groves, Mendenhall, & Scheidecker, 2013; Kleinert, Jones,

Sheppard-Jones, Harp, & Harrison, 2012) to orchestrate networking, technical assistance, evaluation, and dissemination. Over 250 programs are now part of the Think College Program 2016 database (see www.thinkcollege.net).

Postsecondary education (PSE) opportunities positively correlate with positive student outcomes such as being more competitive in the workplace and with needing less on-the-job support (Zafft, Hart, & Zimbrich, 2004). In a large scale study that compared the outcomes of 36,691 individuals with ID, Migliore and Butterworth (2008) found that those who received PSE as part of vocational rehabilitation services were more likely to be employed with significantly more earned income per week than those who did not. Additionally, Weinkauf's (2002) examination of three PSE programs indicated a significant impact on job skills, students' self-esteem, academics, and self-determination skills. Improved social problem-solving skills, independent and daily living skills, and self-advocacy skills also appear to contribute to an improved quality of life in adulthood (Halpern, 1993; Lotan & Eils, 2010). More recently Hendrickson, Vander Busard, Rodgers, and Scheidecker (2013) reported that first-year students with IDD demonstrated the same level of growth in psychological well-being in terms of self-acceptance, personal growth, purpose in life, positive relations with others, environmental mastery, and autonomy as first-year undergraduates. The results of a comparison study of two cohorts of first-year students with ID attending a PSE program and subgroups of undergraduates randomly selected from a sample of 3,083 students in the Wabash National Study of Liberal Arts Education indicates that students with ID are experiencing the same benchmarks of good practices in higher education as measured by the empirically vetted scales of the National Survey of Student Engagement (Hendrickson, Therrien, Weeden, Pascarella, & Hosp, 2015).

Literacy Skills

In spite of the positive outcomes of attending college, many students with IDD do not derive the full benefits of postsecondary education because of their limited literacy skills. Literacy skills are typically defined as an individual's ability to read, write, speak, and compute and solve problems at levels of proficiency necessary to function on the job and in society, to achieve one's goals, and to develop one's knowledge and potential (National Literacy Act, 1991). The ability to read is arguably a most critical skill because it enhances learning opportunities, financial security, and independent functioning (Alwell & Cobb, 2009; Chhabra & McCardle, 2004). Reading is a major area of difficulty for students with IDD (Conners, 1992; Stanovich, 1985). The reading level of school-age children with IDD is typically three years below grade level (Turnbull, Zuna, Turnbull, Poston, & Summers, 2007); 80% of children with IDD do not have minimal reading ability (Katims, 2001). Their difficulties often persist into adulthood and affect all aspects of adult life (Vogel, 1998). Results from the National Longitudinal Transition Study-2 showed that reading skills are highly correlated with peer acceptance, health outcomes, community participation, and a financially secure job (Wagner, Newman, Cameto, & Levine, 2006). Therefore, reading should be an essential instructional goal of PSE for all adult learners (National Adult Literacy Summit, 2000).

Students with IDD often lack critical reading skills including phonemic awareness (Harm & Seidenberg, 1999), phonological knowledge (Iacono & Cupples, 2004), and oral reading fluency (ORF; Saunders & DeFulio, 2007; Wise, Sevcik, Ronski, & Morris, 2010). Successful readers often utilize strategies to actively organize, chunk, or elaborate meaning to facilitate understanding and retention of information derived during the reading process (Williams, 2008). However, students with IDD tend to approach reading passively and do not engage in metacognitive strategies to monitor and manage their thoughts and understanding while reading (L. Baker, 2008). When becoming aware of comprehension difficulties, students with IDD do not use memory and rehearsal strategies to promote their comprehension. As a result, they have little chance of applying textual information to educational, career, and daily life situations.

In the area of written expression, students with IDD oftentimes do not pre-plan what they are going to write, struggle with constructing organized text with a purpose, and do not revise their work for substantive errors (Schumaker & Deshler, 2009; Taft & Mason, 20011). Hayes (2012) posits a framework for the writing process that includes an iterative model of motivation, goal setting, planning, composing, and revising. For students with IDD barriers to effective writing may include: (a) a lack of a strategy or approach for how to pre-plan what to write and how to organize one's writing, (b) difficulties in writing for a purpose (e.g., expository or narrative writing), and (c) difficulty in organizing and recalling content knowledge (Graham, Harris, & Chambers, 2016; Perin, 2013). Graham and Perin (2007) assert that "along with reading comprehension writing skill is a predictor of academic success and a basic requirement for participation in civic life and the global economy" (p. 3). As students with IDD enter postsecondary educational settings they may continue to struggle in the area of written expression.

A Program of Research

A strong evidence base for literacy interventions of young adults with IDD is yet to be established. Pedagogical knowledge of effective reading interventions is primarily derived from research with school-age students (Kruidenier, 2002). Interventions for young adults with IDD must be developed and investigated in authentic teaching-learning environments in higher education. As one of the model demonstration projects funded by the U.S. Department of Education, University of Iowa's REACH program, in collaboration with the special education faculty, conducted the first series of investigations targeting academic skills for young adults with IDD. In this program of research, researchers utilized and modified the interventions that were initially designed to address academic skill deficits of school age children with learning disabilities. Researchers chose these interventions because academic deficits experienced by students with IDD are not qualitatively different from students with learning difficulties (Stanovich, 1985). In the context of a series of small-N quasi-experimental designs and single-case research designs, studies demonstrated that college students with IDD can benefit from interventions using explicit instruction and cognitive strategy instruction. The purpose of this review is to summarize the findings of the studies and the implications from this program of research.

Reading Interventions

Table 1 presents the studies that conducted in the area of reading. Reread-Adapt and Answer-Comprehend (RAAC; Therrien, Wickstrom, & Jones, 2006), vocabulary instruction using constant time delay (CTD), and the Paraphrasing Strategy (Schumaker, Denton, & Deshler, 1984) were the three interventions investigated. The reading skills targeted were Oral Reading Fluency (ORF) and narrative comprehension, vocabulary knowledge, and expository comprehension.

Oral Reading Fluency and Narrative Comprehension.

The first series of studies investigated the effects of the RAAC on ORF and comprehension of the narrative texts. Initially, Therrien and colleagues developed the intervention and found that school age children with learning disabilities improved their reading skills using the RAAC intervention (Therrien et al., 2006). The RAAC intervention has several components. Before each reading, student reads four questions including (a) Who is the main character? (b) What did the main character do? (c) How did the story end? and (d) How did the main character feel? The instructor also tells the student to pay attention to questions when reading the story. The repeated reading requires the student to read instructional level passages three times while the instructor records the finish time and decoding errors. The instructor then provides students with feedback regarding the speed and correction of decoding errors following each reading. After the student finishes reading the passage three times, the instructor asks the student to answer the four prompt questions at the beginning of the reading.

The RAAC intervention addresses both code- and meaning-based reading skills. First, the repeated reading component may help students improve their ORF. Successful comprehension relies on decoding that is fast, accurate, and with proper expression (National Reading Panel, 2000). When decoding is slow, effortful, and with frequent errors, readers do not have sufficient cognitive resources to comprehend text (Fuchs, Fuchs, & Hosp, 2001; LaBerg & Samuels, 1974). Second, the RAAC intervention also addresses narrative reading comprehension (Rashotte & Torgesen, 1985). The four question prompts before each reading serve as an outline and may enhance comprehension monitoring by assisting students to take note of the relevant information as they read (Gersten, Fuchs, Williams, & Baker, 2001).

Using a multiple baseline across participants design, Hua and colleagues (2012) investigated the effects of the RAAC intervention on ORF and narrative text comprehension of three adult learners with ASD. The instructional reading level of the students were 3rd and 6th grade according to the Dynamic Indicators of Basic Literacy Skills (DIBELS; Good & Kaminski, 2002) reading placement criteria. In the study, undergraduate students enrolled in a special education practicum class served as tutors and delivered the intervention. During the baseline, the students read instructional level passage without using the RAAC. The ORF baseline data were slightly ascending for two students while the other student had a descending baseline. Their correct answers to the comprehension questions were highly variable. During the intervention, students received

the RAAC intervention and made immediate gains in ORF from reading the same passage three times.

When comparing individual student's slopes between the two conditions, Hua and colleagues found that one student reversed the descending trend line during the baseline to an ascending trend line during the intervention. The ORF growth of the other two students during the intervention exceeded the baseline level. All three participants exceeded the normative ambitious ORF growth rate (Fuchs, Fuchs, & Hamlett, 1989). In addition, all three students answered more comprehension questions correctly during the intervention than the baseline. The benefits of the intervention generalized to the unpracticed DIBELS passages. Two of the students moved one level higher according to the reading placement criteria.

In a second study, Hua, Therrien, and colleagues (2012) replicated the RAAC intervention with three postsecondary learners using a multiple baseline across participants design. Two of the students had mild ID and one student had severe learning disabilities. Students' reading levels were grade 1, 2, and 6 as determined by their ORF scores. During the baseline, students read an average of 38, 65, and 133 correct words read per minute (CWPM). Two of the students had slight increasing trend while the remaining student had a decreasing trend in CWPM. For reading comprehension, all students had a flat trend and scored an average of 6.67, 6.42, and 5.02 factual and inferential comprehension questions answered correctly. During the RAAC intervention, all three students improved ORF and had an average of 84, 90, and 162 CWPM respectively by the end of the study. Similarly, reading comprehension scores were improved to an average of 7.48, 7.33, and 6 questions answered correctly. Furthermore, the students exceeded the ambitious levels of growth and transferred to unpracticed passages.

The first two studies provided initial evidence that the RAAC was an effective reading intervention for young adults with IDD. In a third study, three young adults with mild ID participated (Hua, Ford, Yuan, Monroe, & Therrien, 2016). Researchers noted a high degree variability of student performance and two students did not improve ORF after the intervention. We modified the RAAC intervention following the diagnostic model proposed by Daly, Martens, Barnett, Witt, and Olson (2007) by adding a goal setting and reinforcement component. According to the goal setting procedure, the two students had to reach the specified ORF goals in order to earn the reward. Initially, both students reached their individual ORF goals in a changing criterion design. However, their data at the conclusion of the study were highly variable and failed to demonstrate sufficient replications, thus making effects of the intervention ambiguous.

The most recent investigation focused on generalization of the effects of the RAAC intervention (Hua, Yuan, et al., 2016). In this study, student ORF and comprehension of the unpracticed AIMSweb passages was used as the dependent measures. Student oral retell was scored using the Index of Narrative Complexity (Petersen, Gillam, & Gillam, 2008). The participants were five young adults with mild ID and Down Syndrome. Results of the study did not demonstrate a functional relation between RAAC intervention and

dependent measures in a response-guided and randomized multiple-baseline across the participant design.

Vocabulary Instruction.

Vocabulary knowledge was another area investigated because it is a critical component of reading comprehension (National Reading Panel, 2000). Teaching information-packed “long nouns” and terminologies that the students are not familiar with may help students comprehend expository text (Fang, 2008; Horn, 2010).

The effects of the vocabulary instruction were examined using constant time delay (CTD) on student knowledge of the terminologies embedded in expository text (Hua, Woods-Groves, & Kaldenberg, 2013). CTD is a prompt fading procedure used to promote independent responding (Dogoe, Banda, Lock, & Feinstein, 2011; Yuan, Balint-Langel, & Hua, in press). In the study, vocabulary instruction using CTD was delivered before the student read each expository text. The intervention started with a 0-s delay, during which the instructor read the terminology and definition from a flashcard (i.e., 0-s delay), followed by the student repeating the terminology and the definition. After the 0-s delay, the student’s response was tested using the 3-s delay. If the student did not read the word or provide a correct definition within 3 s, the instructor repeated the 0-s delay. During the comparison condition, the terminologies before students read the expository material were not taught.

Vocabulary knowledge acquisition, retention, and expository text comprehension was also measured. To examine vocabulary knowledge acquisition and comprehension, the students were asked to answer a series of comprehension questions related to both vocabulary knowledge and content of the expository texts. Retention of vocabulary knowledge was assessed two days after the student reached the mastery criterion. In the context of an alternating treatment design, students learned an average of 84% of the terminologies taught and half of mastered terminologies were further retained in the CTD condition. In contrast, students learned an average of 17% of the vocabulary and 37% of the vocabulary were retained across the three participants in the comparison condition. The results confirmed the effects of CTD on vocabulary knowledge of students with IDD. However, a functional relation between the vocabulary instruction and expository reading comprehension was not found. Students answered a similar number of the reading comprehension questions correctly under the two experimental conditions.

Paraphrasing Strategy and Expository Reading Comprehension.

The effects of paraphrasing strategy on expository reading comprehension was examined. Expository texts are considered more difficult than narrative texts because they are knowledge-based and contain ideas that readers are not familiar with (Baker, Gersten, & Grossen, 2002; Weaver & Kintsch, 1991/1996). The paraphrasing strategy, known by the mnemonic RAP, contains three steps: Read a paragraph, Ask myself “What was the main idea and two details?”, and Put it into my own words (Schumaker et al., 1984). The paraphrasing strategy was selected because it addresses comprehension of expository

text--the most common type of text from which students are expected to learn at the postsecondary level. Research also indicates that teaching students a cognitive process to monitor and evaluate their comprehension may circumvent and compensate for the cognitive deficits associated with their disability (Cain, Oakhill, & Bryant, 2004; Ellis & Lenz, 1987).

Ten students with ID participated in the study; half of the students were randomly assigned to either experimental and control groups. Participants assigned to the experimental group received the comprehension strategy instruction and participants in the control group attended a life skill class at the time of the study. Students in both groups had the minimum of 6th grade instructional reading level ORF according to Fuchs and Deno (1982).

The paraphrasing strategy was implemented using the cognitive strategy development model (Deshler, Ellis, & Lenz, 1996). Six stages were included: (a) assess students before instruction and discuss the rationale for learning the strategy, (b) describe the strategy and get student commitment, (c) model the strategy use with explicit instruction, (d) memorize the strategy, (e) use guided practice to support student learning, and (f) provide opportunities for independent practice. With a cognitive strategy approach, metacognitive awareness and metacognitive skills are built. The learner is responsible for acquiring and becoming proficient in the use of the mnemonic-driven strategy steps. This is accomplished through the systematic teaching of each incremental step, guided practice, and corrective feedback until mastery is achieved. During this highly self-regulated learning process, students set their own learning goals and monitor their own performance.

After each reading, the student was asked to orally retell the score and scored their retell using the rubrics according to Deshler et al. (1996). During the pretest, students in the experimental group recall similar number of main ideas and details to the control group. After the intervention, students in the experimental group recalled significantly more main ideas and details in comparison to the control group. Differences were statistically significant with large effect sizes for recalled main ideas ($d = 4.11$) and details ($d = 2.72$).

Summary.

This series of research provided initial evidence of the effects of the reading interventions on ORF and narrative comprehension, vocabulary knowledge, and expository comprehension of young adults with IDD in the postsecondary setting. The research also identified several areas that require further investigation. First, Hua, Yuan and colleagues (2016) speculated that some young adults with IDD may require additional systematic code-based instruction (e.g., phonological awareness and phonics instruction) and higher level of intensity in order to make meaningful gains in ORF and reading comprehension. Second, Hua and colleagues (2013) were unable to conclude the effects of the vocabulary instruction on expository reading comprehension. They suggested that young adults with ID may need both vocabulary knowledge and strategies to derive meaning from the connected texts to improve their reading comprehension.

Writing Interventions

Table 2 presents the studies conducted in the area of writing. The Essay-Test Taking Strategy (Hughes & Schumaker, 1991) and the EDIT Strategy (Hughes, Schumaker, McNaughton, Deshler, & Nolan, 2010) are two cognitive learning strategies designed to provide learners with feasible steps to improve writing skills. In our investigations with postsecondary students with IDD, instruction for each of these strategies included the following components: (a) explicit instruction with scripted lessons, (b) instructor modeling with “think aloud,” (c) guided practice with corrective feedback, (d) independent practice with feedback, (e) self-graphing of progress, (f) goal-setting (i.e. student criteria 80% mastery on each lesson), (g) use of graphic organizers, and (h) student folders with a graph, a picture of the mnemonic, and graphic organizers with each lesson.

Essay-Test Taking Strategy.

The Essay-Test Taking strategy includes the ANSWER mnemonic which consists of six steps designed to improve learners’ skill in examining an essay test question, pre-planning, and constructing an essay test response. In the ANSWER steps 1 and 2 students read an essay question and “Analyze the action words” by underlining them once and “Notice the requirements” of the question by highlighting them or underlining them twice. As students read the essay question they will underline actions words such as “Compare and Contrast”, “List,” or “Summarize” and notice details such as “one of the types” or “two examples” that pertain to what should be included in their essay response (e.g., scope of response). In steps 3 and 4 students “Set up an outline” with main ideas and “Work in the details.” In steps 3 and 4 students use action words and requirements to create main ideas in outline form with a space underneath. Students then indent under the each main idea and “Work in the details” by providing at least three details under for each main idea. Next, students read their main ideas and details and number them in the order they would like to write about them. In steps 5 and 6 students “Engineer their answers” and “Review their work.” In step 5 students use their outline to construct their essay responses which includes an introductory paragraph or sentence, a paragraph or sentence for each main idea and details, and a summary paragraph. In step 6 students review their essay test response by correcting any grammatical errors and by checking their outline to make sure they included all of their main ideas and details.

Therrien, Hughes, Kapelski, and Mokhtari (2009) conducted the first study with middle school students (7th- 8th grade) who had LD. Students who were taught the strategy demonstrated significant improvement in their essay response writing with regard to strategy use and content and organization when compared to the control group.

Woods-Groves and colleagues conducted four studies with postsecondary students with IDD enrolled in a two-year college program designed to support students with developmental disabilities (Woods-Groves, Alqahtani, Balint-Langel, & Kern, 2018; Woods-Groves et al., 2014; Woods-Groves, Therrien, Hua, & Hendrickson, 2013; Woods-Groves et al., 2012).

Across the four studies, a total of 71 postsecondary students participated. All participants were diagnosed with developmental disabilities (e.g., individuals with Autism Spectrum Disorders (ASD), intellectual disabilities (ID), Down Syndrome). The age range of participants was 17-to-24 yrs. Woodcock Johnson Tests of Achievement III (WJIII; Woodcock, McGrew, & Mather, 2001) Broad Reading scores (with a mean of 100 and *SD* of 15) were reported for three studies. Broad Reading scores across 55 participants ranged from 20 to 102 with an approximate *mdn* = 74. The number of instructional sessions across studies ranged from 6 to 10 sessions. The range of total time to complete intervention instruction ranged from 3 hrs. to 7.5hrs. Pre and posttest prompts remained the same across all four studies. The proximal Strategy Scoring Rubric (Therrien et al., 2009) was used in each study. The Analytic Scoring Rubric, developed by the Oregon Department of Education and denoted as an “Official Scoring Guide” (Oregon Department of Education, 2004-2005), was used in the latter two studies (Woods-Groves et al., 2017; Woods-Groves et al., 2018). Generalization and maintenance was collected. Results across the studies yielded the effect sizes for proximal and distal measures. Strategy Scoring Rubric results were reported as all significant with total score effect sizes that ranged from $d = 1.33$ to 8.63 , as all significant Strategy Use scores with effect sizes that ranged from $d = 1.31$ to 15.85 , and as General Components scores with effect sizes that ranged from $d = .40$ to 1.50 with three of four scores yielding significant results. As the results indicate, the Essay-Test Taking Strategy was effective in improving the postsecondary students with IDD’s skills in analyzing essay test responses, in constructing outlines in pre-planning to write, and in constructing and reviewing their essay test responses.

EDIT Strategy.

The EDIT Strategy is a learning strategy that is designed to improve students’ skill in identifying and correcting editing errors (i.e., spelling, punctuation, capitalization, substance, and overall appearance) commonly found within their electronically written documents. The steps in the EDIT Strategy mnemonic include: (a) Enter your first draft; (b) Do a spell check; (c) Interrogate yourself using the capitalization, overall appearance, punctuation, and spelling (COPS) questions, and (d) Type in corrections and run the spellchecker. Carranza and Hughes (2009) examined the EDIT Strategy with upper elementary and middle school students with learning disabilities. Students were randomly assigned to treatment or control groups. Pre- and posttest results indicated students who were taught the strategy significantly out-performed students in the control group in the total number of errors and error types corrected.

Woods-Groves and colleagues conducted two EDIT Strategy studies with postsecondary students with IDD enrolled in a two-year college program for students with developmental disabilities (Woods-Groves, Hua, Ford, & Neil, 2017; Woods-Groves et al., 2015). For each of the postsecondary studies the EDIT strategy instruction occurred in a computer lab where participants were taught the strategy through explicit instruction. The instructor used a smart projector and computer to guide students through each lesson. Students practiced their skills during guided practice with corrective feedback as they identified and

corrected editing errors in electronic passages. Each lesson ended with students completing an independent practice electronic passage task.

Across the two studies 34 postsecondary students participated. Participants were diagnosed with developmental disabilities which included educational diagnoses such as ASD, ID, and non-verbal learning disorder. The age range of participants was 18 to 23 yrs. Woodcock Johnson III (WJIII) Broad Reading scores (with a mean of 100 and *SD* of 15) ranged from 30 to 95 with an approximate *mdn* = 78. The number of instructional sessions across studies ranged from 11 to 16 sessions. The range of total time to complete intervention instruction ranged from 13.3hrs to 8.25hrs. Pre and posttest prompts remained the same across the two studies. The Scoring Key results for pre- and posttest prompts yielded the following scores - Total Errors corrected, and scores for five error types (i.e., spelling, capitalization, overall appearance, punctuation, and substance). Effect sizes across the studies for Significant Total Errors corrected ranged from $d = .84$ to 1.01. Significant effect sizes for the five error types corrected produced mixed results across the two studies. For both studies the punctuation error type corrected was significant and ranged from $d = .96$ to 1.54. Woods-Groves et al. (2015) reported overall appearance error type as significant $d = 1.06$. In 2017, Woods-Groves and colleagues reported spelling errors and substance errors corrected as significant respectively, $d = .71$ and $d = 1.66$. Results from the EDIT Strategy investigations indicate that individuals who were taught the strategy were able to improve their skill in identifying and correcting editing errors in electronic documents.

Summary.

The Essay Test Taking and EDIT Strategy writing studies were effective in improving the essay writing and editing skills of students with IDD in postsecondary settings. The Essay Test Taking Strategy addressed skills relating to supporting students in constructing responses to essay test questions. Specifically, students were taught strategies in analyzing essay test questions, pre-planning, and constructing essay test responses. The EDIT Strategy intervention taught students skills to correct editing errors. Empirical results supported the use of both strategies in improving essay writing or editing skills for the students who were taught the strategies.

Discussion

Findings from our studies highlighted the importance of teaching cognitive strategies in literacy skills for young adults with ID. Cognitive strategies are designed to teach a series of sequenced procedures that allow an individual to complete a task using the awareness and action of planning, implementing, and evaluating the process and outcome (Reid & Lienemann, 2006). Features of cognitive strategy instruction include teaching students the cognitive skills necessary to perform the skills utilizing both cognitive and metacognitive processes. Meta-analytical reviews have found that interventions using cognitive strategy instruction yielded a strong positive effect size for school age children with learning disabilities (Jitendra, Burgess, & Gajria, 2011).

The cognitive strategies we utilized in the studies improved student learning because they bridged the gap between the demands of academic task and the cognitive profiles of learners with IDD in several ways. First, the strategy reduces the demand on students' working memory by requiring them to break the reading and writing tasks into small units which decreases the amount of information they need to cognitively process. Second, the strategy prompts students to use meta-cognitive process to identify critical attributes and goals of each step so cognitive resources are not expended on irrelevant or incidental information. Third, the strategy facilitates retention and generalization of the skills by providing students with opportunities to utilize the strategies in a variety of contexts and tasks (Ellis & Lenz, 1987).

Across the studies, we found student motivation and persistence had a direct impact on the effectiveness of the interventions. Effective instruction requires the students to be engaged; however, young adults with IDD do not perceive reading and writing tasks as valuable, meaningful, or interesting (Hultsch & Dixon, 1983; Morrow et al., 2009). They lack persistence, in part, because they rarely have experienced knowledge gains or enjoyment from reading or writing (Hultsch & Dixon, 1983). Adult learners with IDD often find academic instruction extremely aversive because of their long history of academic difficulties. As adulthood brings new responsibilities (e.g., employment, independent living, a family or pets to look after, leisure activities: Hultsch & Dixon, 1983; Morrow et al., 2009), learning literacy skills becomes low priorities for adults with IDD and they are unlikely to voluntarily engage in tasks that require such skills. It further decreases the effectiveness of any interventions (Lesgold & Welch-Ross, 2012).

Implications for Practice

One way to support motivation and persistence in reading is the use of materials that promote efficient learning and enhance student motivation (Allor, Gifford, Al Otaiba, Miller, & Cheatham, 2013). It is likely that when academic materials are scaffolded into manageable units of learning, PSE students with IDD will acquire more of the content and be motivated. However, college textual materials seldom scaffold for literacy development, for example, by scaffolding the length of passages, vocabulary, organization of ideas, cohesiveness (Armbruster & Anderson, 1988; Harniss, Hollenbeck, Crawford, & Carnine, 1994). Difficult subject matter and dense textual material decreases motivation and a sense of accomplishment. Therefore, educators must use materials that have textual features that can scaffold learning (Pisha & Coyne, 2001). Broadly, such features include coherence, text structure, and vocabulary (Deshler et al., 1996).

Coherence refers to the transition between the topics and the logical order of the ideas in the text. Texts that utilize organizational signals and transitional phrases facilitate comprehension. Text structure refers to how the ideas are organized in the text. Expository texts used in college courses generally have complex structures including descriptions, temporal sequences of events, explanations, definitions and examples, compare-contrast illustrations, and problem-solution-effects scenarios (Armbruster & Anderson, 1988). These features need to be adjusted for the student with IDD to access the intent and content of the material. Scaffolding vocabulary is also associated with student success. Texts with a small number of new vocabulary words and with frequent

repetition of those words contribute substantially to student comprehension gains (Allor et al., 2013). Embedding vocabulary from prior learning can facilitate an understanding of how concepts are related.

A high degree of variability among the students, with regard to their responsiveness to the interventions, was noted in this research review. Outcome variability is not surprising because a research-based intervention, in and of itself, does not guarantee success with every student (Kratochwill, Clements, & Kalymon, 2007; Lovett & Eckert, 2009). Young adult learners with IDD enrolled in the inclusive postsecondary education are likely to have substantially greater divergence in their academic skills than school-aged students with IDD. Some learners with IDD in PSE programs only have the most elementary reading and writing skills while others read at a higher level (Morgan & Moni, 2008). Students with IDD who have significant skill deficit require a substantially more intensive comprehension intervention than typically developing students (Allor, Mathes, Roberts, Cheatham, & Al Otaiba, 2014; Wei, Blackorby, & Schiller, 2011) and more intensive instruction than students with other disabilities (Connor, Alberto, Compton, & O'Connor, 2014). For young adults with IDD to benefit from any academic intervention it is likely that they, similar to school-aged students with IDD, will require extended, intensified opportunities to learn.

It is clear that these students will not respond in the same way to any given intervention; these students are likely to require instruction be delivered in different ways and with different levels of intensity. For an intervention to be efficacious, the intervention must differentiate between those who need additional intensified learning and those who do not. Based on the reviewed research, we concur with Connors (2003), who calls for adaptive academic interventions; that is, interventions which utilize the most optimal components (based on current knowledge) and allow for intensity level adjustment(s). The ultimate goal is to identify the level of instructional support that optimizes the acquisition and retention of academic skills for each individual student.

Educators can use ongoing formative assessment data to monitor student responsiveness to achieve this adaptive purpose. When students do not progress at an acceptable rate, educators can intensify the intervention by increasing the instructional time with study tables, labs, and a variety of tutoring options. The expanded and/or intensified instructional time should be mediated by trained peers and/or mentors. Using an adaptive intervention will allow the educators to deliver the more intensive intervention to only those who need it. By doing so, feasibility and sustainability are enhanced because instructional resources are only allocated where they are needed.

Conclusion

Higher education increasingly includes a diverse population of students, many of whom might be described as struggling learners, including young men and women with IDD. To meet these students postsecondary educational and career preparation needs will require that colleges and universities develop innovative, forward thinking strategies for supporting student learning, increasing graduation rates, and positively impacting the life trajectories of graduates. Developing interventions that address the rapidly growing need for effective instruction for young adults with IDD to ensure such learners derive full benefit

from the PSE opportunities now afforded them. Results from studies indicate that adult learners who have limited literacy skills can still benefit from interventions that address both basic and more complex academic skills regardless of age. For students with IDD, elements likely to be required include instruction that is delivered systematically, with high intensity, and contextualized in valued, relevant content. Retention and generalization are unlikely to occur without these features.

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Table 1
List of studies that target reading skills

| Study | Participants | Intervention | Experimental Design | Dependent Measures | Target Academic Skills |
|---|---------------------|-----------------------|--|--|--|
| Hua, Hendrickson, et al., 2012 | 3 students with IDD | RAAC | Multiple baseline across participants | Correct words per minute, Decoding Errors, and Reading Comprehension Questions | Oral reading fluency and narrative comprehension |
| Hua, Therrien, et al., 2012 | 3 students with ASD | RAAC | Multiple baseline across participants | Correct words per minute, Decoding Errors, and Reading Comprehension Questions | Oral reading fluency and narrative comprehension |
| Hua, Ford, Yuan, Monroe, & Therrien, 2016 | 3 students with IDD | RAAC + Goal Setting | Combined single case research design | Correct words per minute, Decoding Errors, and Reading Comprehension Questions | Oral reading fluency and narrative comprehension |
| Hua et al., 2018 | 5 students with IDD | RACC | Multiple baseline using mask visual analysis | Correct words per minute, Decoding Errors, and Index Narrative Retell | Oral reading fluency and narrative comprehension |
| Hua, Woods-Groves, & Kaldenberg, 2013 | 3 students with ASD | Constant Time Delay | Alternating treatment design | Vocabulary knowledge acquisition and retention, and comprehension | Vocabulary knowledge |
| Hua, Woods-Groves, Ford, & Nobles, 2014 | 3 students with IDD | Paraphrasing Strategy | Small group design | Expository retell | Expository comprehension |

Table 2*List of studies that target writing skills*

| Study | Participants | Intervention | Experimental Design | Dependent Measures | Target Academic Skill |
|--|----------------------|-----------------|--------------------------------------|--|-----------------------|
| Woods-Groves et al., 2012 | 16 students with IDD | ANSWER Strategy | Group studies with random assignment | Strategy rubric total, strategy use, and generalization | Essay Writing |
| Woods-Groves, Therrien, Hua, & Hendrickson, 2013 | 16 students with IDD | ANSWER Strategy | Group studies with random assignment | Strategy rubric total, strategy use, and generalization | Essay Writing |
| Woods-Groves et al., 2014 | 19 students with IDD | ANSWER Strategy | Group studies with random assignment | Strategy rubric total, strategy use, generalization, and analytic rubric total and ideas/content | Essay Writing |
| Woods-Groves et al., 2015 | 19 students with IDD | EDIT Strategy | Group studies with random assignment | Total number of errors and five error types | Editing |
| Woods-Groves, Hua, Ford, & Neil, 2017 | 15 students with IDD | EDIT Strategy | Group studies with random assignment | Total number of errors and five error types | Editing |
| Woods-Groves, Alqahtani, Balint-Langel, & Kern, in press | 20 students with IDD | EDIT Strategy | Group studies with random assignment | Strategy rubric total, strategy use, generalization, and analytic rubric in 6 areas | Editing |