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Efficacy of an Electronic Editing Strategy with College Students with Intellectual and Developmental Disabilities

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Abstract: In this study we investigated an editing strategy to develop effective proofreading skills (i.e., mechanics and substantive revisions) within electronic texts through an experimental pre- and posttest group design with random assignment. Fifteen college students with intellectual and developmental disabilities participated in this investigation. The results of this study reveal a significant positive difference for the EDIT Strategy instruction group when compared with the non-intervention group for the total number and type of editing errors corrected in the posttest and follow-up 5 and 11-week maintenance phases. The findings support the use of the EDIT Strategy with study participants in improving the editing skills of postsecondary learners with intellectual and developmental disabilities.

Over the past decade there has been an ever-increasing emergence of postsecondary educational programs for students with intellectual and developmental disabilities (IDD) within the United States. In 2011 nationwide enrollment in postsecondary programs for students with IDD included approximately 44% of young adults with autism and 29% with an intellectual disability (Newman et al., 2011). Currently, there are more than 260 diverse programs located at community colleges and four-year universities (Think College Program Database, 2016). The reauthorization of the Higher Education Opportunities Act (2008) provides financial support (e.g., Pell grants) for college students with IDD who qualify. In 2010, the federal government provided further support through the funding of the Tran-

sition Postsecondary Program for Students with Intellectual Disability (TPSID) model demonstration program grants. This funding supported 27 pilot postsecondary education programs and the development of a national coordinating center (Grigal et al., 2015).

The overall mission and objectives of various postsecondary programs that serve students with IDD differ across programs and institutions. However, one common trend is emerging with regard to student access to academic instruction. All postsecondary students with IDD received academic instruction according to the TPSID Annual Report 2013–2014. Specifically, 52% of the students attended specialized academic courses and 48% attended inclusive academic courses in their respective postsecondary programs (Grigal et al., 2015, p. 2).

As postsecondary programs expand, new opportunities emerge to explore students' personal academic strengths and areas of need as they exit their high school programs and enter postsecondary environments. As a result, this has bolstered an important paradigm shift from the implementation of functional skills program planning to a focus on academic skills instruction for postsecondary students with IDD (Woods-Groves et al., 2014;

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Woods-Groves et al., 2015). This has created an impetus for the development of effective academic programming for young adults with IDD in core literacy areas such as written expression.

Despite the need for effective instructional practices currently, there is a paucity of empirical support for the use of specific evidence-based instruction in the area of written expression for postsecondary students with IDD (Woods-Groves et al., 2014). Core academic literacy skills such as expertise in written expression continue to be an area of concern for students with and without disabilities in elementary and secondary settings and as they enter college (MacArthur, Graham, & Fitzgerald, 2016; National Commission on Writing, 2004). The National Assessment of Educational Progress 2011, computer-based writing assessment results, revealed that for those students who participated in the assessment, 74% of eighth-grade students and 73% of 12th grade students within the US performed below the proficient level (National Center for Education Statistics, 2012).

The process of writing permeates across one's lifespan and influences personal success in the areas of living, learning, and working. Writing is produced from a contextual viewpoint (e.g. knowledge of a topic, writing for a purpose) and is a communicative act (Bazerman, 2016; Hayes, 2012; Hayes & Flower, 1987). Within the area of written expression, the process of motivation, planning, producing text, revising, and editing is a complicated and fluid endeavor (Graham, Bollinger, et al., 2012; Hayes, 2012; Hayes & Flower, 1987). An iterative relationship exists between each component of the writing process (Englert, 2009; Hayes, 2012; Scott & Vitale, 2003).

Learners with disabilities in elementary and secondary school settings who struggle in the area of written expression can experience the following difficulties during the writing process: (a) ineffective planning and goal setting, (b) not constructing text beyond knowledge telling, and (c) difficulty in identifying and correcting errors in mechanics in written products (Graham & Harris, 2003; Guzel-Ozmen, 2006; Scott & Vitale, 2003). In addition, learners with disabilities can experience difficulty with revising and editing written products beyond mechanics in order to focus

on substance and content. Novice or struggling writers have been reported to spend an inordinate amount of time during the editing and revision process in the identification and correction of mechanics (e.g., spelling, capitalization, punctuation) and less time on revising content and in writing for an audience (Graham & Harris, 2003; MacArthur, 2016; Schumaker & Deshler, 2009).

Effective instruction in the area of written expression targets process and product outcomes and involves foundational skills (e.g., handwriting or typing text, mechanics of writing) and more advanced endeavors such as writing for a purpose in narrative, expository, and persuasive essays (Berninger, Garcia, & Abbott, 2009). For elementary and secondary learners who struggle with writing and for students with disabilities such as learning disabilities, intellectual disability, autism, and Asperger's syndrome previous studies and empirical reviews have supported the use of explicit instruction and strategy instruction (Delano, 2007; Graham, Bollinger, et al., 2012; Graham, Harris, & Chambers, 2016; Graham, McKeown, Kiuvara, & Harris, 2012; Graham & Perrin, 2007; Guzel-Ozmen, 2006; Joseph & Konrad, 2008; Konrad, Trela, & Test, 2006; Pennington & Delano, 2012; Schumaker & Deschler, 2009). Components of explicit instruction include direct and systematic modeling, guided practice, and independent practice of target skills (Archer & Hughes, 2010; Schumaker & Deshler, 2009). Philippakos, MacArthur, and Coker (2015) define a strategy as "... a conscious, cognitive process for completing complex tasks" (p. 2). Strategy instruction encompasses a mnemonic-driven format to frame the target skill and to aid in acquisition and retention of the strategy steps (Conderman, Hedin, Bresnahan, 2013). Elements of strategy instruction include the following (a) pre- and post-instructional assessment, (b) explicit instruction to teach skills in a systematic and sequential fashion, (c) mastery-based learning (i.e., students do not move to the next skill until they master the current skill meeting a predetermined criterion-80%), and (d) self-regulation skills such as goal setting and self-evaluation (Conderman et al., 2013; Englert, Raphael, & Anderson, 1992; Harris, Graham, Brindel, & Sandmel,

2009; Reid, Lienemann, & Hagaman, 2013; Schunk & Zimmerman, 2007).

While empirical support exists for the efficacy of explicit instruction and strategy instruction for elementary and secondary learners with disabilities who experience writing difficulties, there is a paucity of empirical support for evidence-based writing instruction for postsecondary learners with IDD. Several studies have explored the use of strategy instruction in the area of expository essay construction (Woods-Groves et al., 2012; Woods-Groves, Therrien, Hua, & Hendrickson, 2013; Woods-Groves et al., 2014) and in computer-based editing and revising (Woods-Groves et al., 2015). Due to the expansion of postsecondary programs for learners with IDD, it is necessary to identify and implement effective writing instruction for individuals who continue to have difficulty in this area as young adults. The purpose of this study is to examine the efficacy of employing an electronic editing strategy, the EDIT Strategy (Hughes, Schumaker, McNaughton, Deshler, & Nolan, 2010) for college students with IDD.

The authors of the EDIT strategy (Hughes et al., 2010) incorporated aspects of two previous strategy instructional programs the Error Monitoring Strategy (Schumaker, Nolan, & Deshler, 1985) and the InSPECT Strategy (Naughton & Hughes, 1999). The EDIT Strategy incorporates evidence-based aspects of systematic instruction such as explicit instruction (Archer & Hughes, 2010). Additional EDIT Strategy components encompass (a) mastery-based learning (Schumaker & Deshler, 2009), (b) self-regulation through goal setting and self-evaluation (Schunk & Zimmerman, 2007), and (c) mnemonic prompting (Conderman et al., 2013; Mastropieri & Scruggs, 1991). The EDIT Strategy steps guide the learner through the electronic editing process using word processing and spell check.

There have been two previous investigations of the EDIT Strategy. Carranza and Hughes (2009) examined the utility of the EDIT Strategy instruction to improve the editing skills of “upper elementary and middle school students” ($n = 22$) who were diagnosed with learning disabilities (Hughes et al., 2010, p. 2). A random assignment placed students in instruction or control groups. The authors

used a pre- and posttest experimental design. The students in the EDIT strategy instruction group significantly outperformed the control group following 2 to 3 weeks of 4 total hours of EDIT Strategy explicit instruction. The students who mastered the EDIT Strategy improved their pretest average “percentage of editing errors corrected from 28% to 80%” (Hughes et al., 2010, p. 2). Students in the EDIT strategy group maintained their posttest level editing skills several weeks following the end of the intervention (Hughes et al., 2010).

Woods-Groves et al. (2015) investigated the EDIT Strategy with college students with IDD ($n = 19$) who were enrolled in a campus-based, postsecondary 2-year certificate program for students with developmental disabilities. The college students were randomly assigned to intervention ($n = 11$) or control groups ($n = 8$) with a pre- and posttest design. The pre- and posttests consisted of two electronic passages of approximately, 220 words, written at the third-grade reading level. Each prompt consisted of 25 editing errors with five respective error types (i.e., spelling, capitalization, overall appearance, punctuation, substance). Following administration of a pretest to all college students, the intervention group received EDIT Strategy instruction in a large group format in a computer lab. Each college student had a PC computer and used Microsoft Word to edit electronic documents. Upon the completion of 16 EDIT Strategy lessons, administered twice weekly for 50-minute sessions, a posttest was administered to all college students. Results revealed that the intervention group significantly outperformed the control group in the Total Number of Editing Errors corrected and yielded a large effect size $p = .011$, $d = 1.01$. With regard to specific editing errors college students in the intervention group corrected a significantly higher number of Overall Appearance errors, $p = .048$, $d = 1.06$ and Punctuation errors, $p = .004$, $d = 1.54$ when compared to the control group. Comparisons of the intervention and control groups revealed no significant differences for Spelling, Capitalization, and Substance errors (Woods-Groves et al., 2015). The authors administered a maintenance prompt 12 weeks after the posttest. College students in the intervention group corrected a significantly higher Total Number of Editing Errors,

$p = .029$, $d = 1.19$ and a significantly higher number of Overall Appearance errors, $p = .004$, $d = 1.67$ when compared to the control group.

There were several limitations noted in the Woods-Groves et al. (2015) study. The first limitation was that the administration time of the total intervention was 16 lessons resulting in a total of 13.3 hours of teacher-led instruction. Future studies should investigate the efficacy of a shorter intervention period. The second limitation pertained to the fact that significant differences for college students who were taught the EDIT Strategy when compared with peers who did not receive the strategy instruction were revealed for two (i.e., overall appearance and punctuation) of the five editing correction error types. The dependent measures (i.e. pre- and posttests) noted in the Woods-Groves et al. (2015) study could be adapted to avoid a “ceiling effect” by extending the measure to include a higher instance of editing errors for each respective editing type in order to provide an opportunity to expand the possible range of student performance that could be measured (p. 105).

This current investigation of the EDIT Strategy incorporated aspects to address the limitations found in the Woods-Groves et al. (2015) study. This study used a shortened duration of the overall intervention with 11 instructional lessons instead of 16. Pre- and post-test editing errors were expanded to include 30 editing errors versus 25 editing errors with one additional error for each respective error type (i.e., spelling, capitalization, overall appearance, punctuation, substance). The following research questions were examined:

1. Will college students with IDD who received the EDIT Strategy instruction correct a significantly higher number of editing errors when compared to college students who did not receive the instruction?
2. Will college students who received the EDIT Strategy instruction correct a significantly higher number of respective types of editing errors (i.e. spelling, capitalization, overall appearance, punctuation, and missing words) when compared to

students who did not receive the instruction?

3. Will college students who receive the EDIT Strategy instruction obtain significantly higher overall and respective error type EDIT scores compared to college students who did not receive the instruction during the maintenance stage?

Method

Participants

Fifteen young adults with developmental disabilities from a two-year postsecondary program for students with IDD participated in this study. The college students were in their second year of the 2-year postsecondary program located at a Midwestern University and ranged in age from 18-to-23 years ($M = 19.40$, $SD = 1.40$). College students entered the program with the following diagnoses: three (20%) individuals with Pervasive Developmental Disorders, one (7%) with autism, six (40%) with an intellectual disability, four (26%) individuals with multiple disabilities, and one (7%) individual with Down Syndrome and an intellectual disability.

There were six (40%) females and nine (60%) males. With regard to race, all of the college students were White and were from the following demographic areas: four (26.7%) rural, five (33.3%) suburban, and six (40%) urban. Individuals were from eight states across the United States. The college students' Woodcock Johnson Tests of Achievement III (WJIII; Woodcock, McGrew, & Mather, 2001) standard Total Scores (i.e., mean of 100 and standard deviation of 15), ranged from 20 to 90, (Mdn , 74). Their WJIII Broad Reading scores ranged from 30 to 87, (Mdn , 78) while their WJIII Broad Writing scores ranged from 30 to 95, (Mdn , 79). The 15 college students were stratified based upon their total WJIII Total Scores and were randomly assigned to intervention ($n = 7$) and control ($n = 8$) groups using a coin flip (i.e., heads = intervention group; tails = control group).

Material

We used the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski,

2002) oral reading fluency (i.e. DORF) and Retell Fluency (RTF) tests to determine the reading level of the college students with IDD. The college students were administered the assessments prior to the administration of the EDIT pretest prompts. The results delineated that the lowest reading level within the group was third-grade. As a result, the reading prompts and materials were adapted to not exceed the third grade level.

The EDIT Strategy instructional manual (Hughes et al., 2010) was used to create all EDIT lessons. We developed and adapted pre- and posttest EDIT prompts, instructional materials, practice prompts, and maintenance prompts to not exceed the 3.0 reading level. Lessons included graphic organizers with steps of the EDIT mnemonic. Instructional materials for each student included a computer flash drive, a folder containing a graph for self-monitoring, graphic organizers, and relevant cue sheets at the start of each lesson. Instruction occurred in a computer lab on campus. A staff member of the postsecondary program implemented EDIT Strategy lessons. The staff member used a projector, document camera, and PC desktop computer at the front of the computer lab to teach each lesson. Participants had access to a PC desktop computer for each lesson.

The original EDIT pre- and posttest prompts provided in the EDIT Strategy manual (Hughes et al., 2010) adapted and employed in Woods-Groves et al. (2015) were used in this study. The prompts were adapted to not exceed the third-grade reading level. In addition, five more grammatical errors were added to each prompt (i.e., original prompts each had 25 errors). The two pretest prompts, Prompt A, "Giant Panda," and Prompt B, "California Redwood," each consisted of three paragraphs. Prompt A contained 221 words and addressed the behavior and natural location of Giant Pandas. Prompt B contained 222 words and provided information about the California Redwood. Each prompt contained 30 errors.

For each EDIT prompt types of errors were related to capitalization (e.g., beginning of the sentence or proper nouns), overall appearance (e.g., inappropriate spacing or indentation), punctuation (e.g., inappropriate use of periods, commas, question marks, etc.),

and substance (i.e., missing words). Missing words were limited to articles (e.g., a, an, the, or the subject of the sentence). Spelling errors were also present within each EDIT prompt. For spelling errors, two were contextual (e.g., a homophone) and four were incorrectly spelled words.

We used teacher material from the EDIT Strategy instructional manual to develop two maintenance prompts that did not exceed the third-grade reading level and that included 30 errors (i.e., six errors for each of the five error types). The first maintenance prompt was administered after five weeks following the completion of the EDIT intervention and was adapted from the EDIT Strategy manual (Hughes et al., 2010). This prompt pertained to a description of a family named the "Kettles" and consisted of 204 words. The second maintenance prompt was administered 12 weeks following completion of the EDIT intervention. This prompt consisted of 211 words and pertained to "purchasing a vehicle."

Design and Procedure

Design. For this study an intervention/control two-level, single factor, pre- and posttest experimental design was employed. There were 15 college students who were each randomly assigned to groups using a coin flip (i.e., heads = intervention group; tails = control group). The intervention and control groups consisted of seven and eight college students respectively. All of the college students were administered the pretest one week before the beginning of the EDIT Strategy instruction. The EDIT pretests consisted of a randomly assigned Prompt A or Prompt B passage. Two different prompts were used to control for difficulty levels between the pre- and posttest prompts, for instance, individuals who received Prompt A for the pretest would receive Prompt B for the posttest.

The college students were administered the pre- and posttests in a large group format and were given either Prompt A or Prompt B formatted in a Microsoft Word document on their PCs. Directions for the pre-, post-, and maintenance tests included the instructor telling individuals, "We have placed a word document on your computer. When I tell you please click on the document to open it. You

<ul style="list-style-type: none"><input type="checkbox"/> Enter Your First Draft<input type="checkbox"/> Do a SPELL Check. Put cursor at beginning<ul style="list-style-type: none"><input type="checkbox"/> Read the sentence with the error out loud<input type="checkbox"/> Select the correct option<ul style="list-style-type: none"><i>* If you don't see the correct option</i><ul style="list-style-type: none"><input type="checkbox"/> 1. Say the word aloud.<input type="checkbox"/> 2. Add any letters that you hear.<input type="checkbox"/> 3. Run the spellchecker on the word.<input type="checkbox"/> 4. If you see the correct option, select it.<input type="checkbox"/> Pass over the document<input type="checkbox"/> Express each sentence<input type="checkbox"/> Look for homophone errors<input type="checkbox"/> Look for typos	<ul style="list-style-type: none"><input type="checkbox"/> Interrogate yourself Use the COPS Questions<ul style="list-style-type: none"><input type="checkbox"/> Put the cursor at the end of the document<input type="checkbox"/> Capitalization questions<ul style="list-style-type: none"><input type="checkbox"/> Look at the beginning of sentences<input type="checkbox"/> Proper Nouns (people, places, and things)<input type="checkbox"/> Overall appearance questions<ul style="list-style-type: none"><input type="checkbox"/> look at paragraph indention<input type="checkbox"/> Spacing between sentences<input type="checkbox"/> Punctuation questions<ul style="list-style-type: none"><input type="checkbox"/> Is there punctuation at the end of the sentence?<input type="checkbox"/> Is it correct?<input type="checkbox"/> Substance questions<ul style="list-style-type: none"><input type="checkbox"/> Read the sentence out loud.<input type="checkbox"/> Is the sentence missing any words.<input type="checkbox"/> Does it make sense?<input type="checkbox"/> Type in corrections and run spellchecker
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Figure 1. EDIT Strategy Graphic Organizer (adapted from Hughes et al., 2010).

will have 30 minutes to read the document and then run the spell checker and correct any errors you find” (adapted from Hughes et al., 2010). If an individual met or exceeded the criterion of 80% accuracy on the pretest, he or she was excluded from the study. None of the college students met or exceeded 80% accuracy on their pretest. As a result, all college students were included as participants in this study.

Intervention. The EDIT intervention was implemented in 11 sessions of 45 minutes each for 5.5 weeks. Instructional sessions were conducted twice a week on Tuesday and Thursday. The cumulative instruction time was approximately 8.25 hours. For this current investigation the scope and sequence of the EDIT intervention lessons were designed to spend less time on the sessions pertaining to “reviewing using the spell check steps” than reported in the Woods-Groves et al. (2015) study (i.e., three lessons in the current investigation verses seven lessons in previous study). In addition, two lessons reported in the Woods-Groves et al. (2015) study were eliminated that pertained to “guided practice with all the EDIT Strategy steps.” Individuals were administered the EDIT Strategy in a group setting during a regularly scheduled course designed to teach editing strategies.

The instructor, a staff member of the postsecondary education program students attended, and the study’s first author met prior to each lesson to review the EDIT manual, lesson plans, and materials.

The instructor used the EDIT mnemonic and a sequence of explicit instruction lessons to teach the EDIT Strategy. Figure 1 depicts the EDIT mnemonic in graphic organizer form. The instructor taught the EDIT Strategy to the intervention group over the course of 11 sessions. The EDIT Strategy steps, and a summary of each lesson, are depicted in Table 1. The instructor delivered explicit instruction adapted and scripted lessons from the EDIT Strategy manual. For each lesson the instructor used an advance organizer that included the material taught during previous and present session, and instructor expectations for students (e.g., taking notes, paying attention).

The instructor used a “think aloud” technique to model skills taught during each lesson followed by guided practice with immediate corrective feedback. An example of a Scoring Key for a Corrective Feedback Passage is depicted in Figure 2. Individuals completed an independent mastery exercise following guided practice and immediate feedback and graphed their scored independent work. The criterion for mastery for independent exer-

TABLE 1
Components of EDIT Strategy Lessons (adapted from Hughes et al., 2010)

<i>Lesson</i>	<i>Sessions</i>	<i>Lesson Activities</i>
1	1	The instructor asked the students to describe the strategies they used when editing Word documents. The instructor then explained the utility of the EDIT strategy and introduced EDIT mnemonic. At the end of the lesson, the students made a commitment to learn the EDIT strategy.
2	4	The instructor taught the first two steps of the EDIT strategy (i.e., “Examine your first draft.” and “Do a SPELL Check”). Students learned how to open and examine a Microsoft Word document and use spellcheck. During spellcheck, students learned to correct errors according to the following rules. First, review the spellcheck suggestion and choose the correct word if it is available. Second, if the correct word is not available sound out the incorrectly spelled word, correct it, and run the spellcheck again. Third, replace the incorrectly spelled word with a different word that has the same meaning if correct spelling is not available.
3	2	The instructor and students reviewed the previous two steps (i.e., examine your first draft, do SPELL Check). The instructor then modeled the COPS Questions (i.e., Were there any capitalization, overall appearance, punctuation, or substance errors) using think-aloud. Students practiced each step with instructor’s guidance. At the conclusion of the lesson, the instructor taught the last step of the EDIT strategy (i.e., Correcting typos and running the spell checker again).
4	1	The instructor first evaluated student understanding of the steps and the rationale. The instructor then provided additional verbal practice for students to memorize the EDIT steps. At the end of the lesson, the instructor assessed student recall of each step and their description of the rationale using one-on-one assessment.
5	3	The instructor and the students discussed how and why they would apply the steps of SPELL and COPS when editing passages in Word document followed by guided practice. During guided practice, the students received immediate feedback from the instructor. After successful guided practice, the students practiced the EDIT strategy independently and recorded their score on a graph.

cises was 80%. EDIT Strategy lessons included a graphic organizer with current and previous strategy steps. Each lesson also included a visual depiction of the EDIT mnemonic which was located on the front of students’ folders. The mnemonic also included boxes for students to check off as they completed each EDIT Strategy step. Figure 1 shows the EDIT mnemonic graphic organizer.

Individuals used a flash drive to upload a model passage, a guided practice passage, and an independent passage to their desktops at the beginning of each EDIT Strategy lesson. Next, the instructor guided individuals through each previously taught EDIT Strategy step prior to introducing (i.e., model) the steps to be taught during the current lesson. A compact disc, provided by the EDIT Strategy

manual, contained teacher and student passages for each lesson. Passages were adapted to not exceed the third-grade reading level. Further, original passages were also developed. These passages included approximately 25 to 30 errors. Guided practice and independent passages included only previously taught types of errors (i.e., spelling, capitalization, punctuation, overall appearance, substance/missing words).

Spelling errors within passages consisted of either misspelled words or contextual spelling errors (e.g., homophones). Two types of misspelled words were present in EDIT passages. The first type of spelling errors included those where the spell checker would present the first or second selection. The second type included errors that required individuals to

Lesson 3 Corrective Feedback Passage Key

My name **(is)SM peggy.(C)** One of my favorite things to do is to go on **vacatin.(S)** I love to travel to fun and **exsiiting (S)** places. I have been to many different places. **(O)**I went to Destin, **florida(C)** to the beach last week**(P)**

(O) The beaches **were (SM)** pretty with white soft sand. **(O)** The ocean was deep blue and green. The sun was bright **and (SM)** warm. I swam in the ocean and went under the water? **(P)** I saw starfish and sea shells. I also rode in a boat on the ocean. **while(C)** I was in the boat I saw **for(H) dofhins (S)** playing in the ocean. There was a **moter, (S)** father, and two baby dolphins. I fed them fish! It was fun and exciting**(P)**

(O)I stayed in **a (SM)** hotel with fresh sheets and pillows on the bed. **at (C)** night I watched television and ordered room service. It was **so (SM)** much fun. **the (C)** next day I went fishing with my mom and dad. I had a fishing pole and used a worm on my hook? **(P)**

(O) This was the first **tme (S)** I had ever fished? **(P)** Soon there was a pull on my fishing line. I pulled the line out of the water. **(O)**I thought I would see a fish on the other end. **All(C)** I saw was **an (SM)** empty hook! That fish ate my worm and got away**(P)**

Errors	Spelling		Capitalization	Overall Appearance	Punctuation	Substance Missing Word
30 Total	5	1 (H) Homophone	6	6	6	6
Errors corrected						
Not corrected						

_____ correct out of 30 = _____%

_____ total errors

Circle errors in document that occurred before feedback

Figure 2. Corrective Feedback Scoring Key.

identify the sounds missing from the misspelled word, add the corresponding letters, and then use the spell checker to find and select the correct option. Capitalization errors were words not capitalized at the beginning of sentences and proper nouns within passages. Punctuation errors were errors at the conclusion of sentences and the use of punctuation (e.g., commas) within passages. Overall appearance errors were paragraphs that were indented incorrectly or not at all, paragraphs with additional spaces between them, and instances of incorrect spacing (i.e., too many spaces or no spacing) between words within or between sentences. Substances errors were missing words within sentences that included nouns, pronouns, or articles (i.e., a, an, the).

Passages ranged from approximately 198 to 240 words and contained three or four paragraphs. Topics covered in EDIT passages included but were not limited to the following: (a) vacation destinations, (b) favorite pets, and (c) family vignettes.

Two raters collected data using an instruction integrity checklist for each lesson. The checklist defined the instructional components (e.g., advance organizer, instructor expectations, EDIT Strategy steps taught) for each EDIT Strategy lesson. Raters observed the instructor and checked off instructional steps as they were completed.

Control group. The control group received science instruction while the intervention group received EDIT Strategy instruction.

Both groups received regularly scheduled (e.g., career development, money management) instruction throughout the week. Students attended their daily scheduled classes.

Dependent variable. Raters used EDIT Strategy scoring keys to score the pre- and posttest EDIT prompt responses for Prompt A and Prompt B. The total number of errors corrected yielded a total score that could range from 0 to 30. The specific error categories (i.e., spelling, capitalization, overall appearance, punctuation, and substance/missing words) yielded separate scores that could range from 0 to 6 for each error category.

Data collection. The college students were administered the pretest EDIT Strategy prompt and posttest EDIT Strategy prompt in a large group setting 1 week prior and 1 week following EDIT Strategy instruction. Individuals were administered two follow-up maintenance tests for 5 week and 12 week respective time periods. Two graduate students enrolled in the College of Education, scored the pre- and posttest prompts, as well as maintenance tests. The students had previous experience in administering and scoring assessment materials. The first author provided each rater with an EDIT scoring key for Prompt A and Prompt B. Raters were unaware of whether or not the prompts they scored were products of individuals in the intervention or control groups. The first author met with raters to review the six scoring components and to discuss the types of corrections that individuals might have provided.

Data Analysis

A power analysis was conducted via G power 3 (Faul, Erdfelder, Lang, & Buchner, 2007). Our previous experimental studies yielded large Cohen's *d* effect sizes ranging from .95 to 2.63 (Woods-Groves et al., 2014; Woods-Groves et al., 2012; Woods-Groves et al., 2013). We used a large effect size of .80 based upon our previous work with experimental studies. The power analysis based on an alpha of .05, a large effect size .80 (Cohen's *d*), and .80 for power a minimum and revealed that a minimal sample size of 15 for two groups ($N = 14.6429 - N = 15$) would be adequate. Statistical software IBM SPSS 23 (2016) was used to analyze college students' data. The pretests

EDIT scoring key results were examined via an analysis of variance (ANOVA). The posttests and maintenance EDIT scoring key results were examined via a series of analysis of covariance (ANCOVAs) with the pretest as a covariate. To examine the strength of statistically significant findings, Cohen's *d* effect sizes were used. Thus, effects sizes of $<.2$ were considered small, $<.5$ were considered medium, and $>.8$ were considered large (Cohen, 1988).

Results

Instruction Integrity and Inter-Rater Reliability

Two raters completed instruction integrity checklists for each lesson that contained the steps for each respective lesson. There was a 100% overall instruction integrity for each of the EDIT Strategy integrity checklists. The inter-rater reliability for the raters' scores for the pre- and posttests and for both maintenance tests were compared and resulted in correlations that ranged from 1.00 to .93 ($Mdn = .99$) across all areas (i.e., the Total EDIT score and each of the five editing error types). The analyses of the results used the average from the two raters' scores for the EDIT pre- and posttest scores and two maintenance probes.

EDIT scoring key. We examined raters' average scores from the pretest EDIT scoring key results for the EDIT Strategy intervention and control groups. No significant differences were revealed for the scoring key Total EDIT and respective error type comparisons (i.e., spelling, capitalization, overall appearance, punctuation, substance) results. Table 2 provides mean values, standard deviations, *p* values, effect sizes, and ANOVA results for the pretest.

A series of ANCOVAs were used to examine potential differences between the intervention and control groups' posttests EDIT scoring key results using the pretests results as the covariate. ANCOVA results for the raters' average Total EDIT scoring key posttest scores for the instruction and control groups yielded significant results with a large effect size in favor of the intervention group $p = .006$, $d = .84$. Potential differences for each of the five types of editing errors (i.e., spelling, capitalization, overall appearance, punctuation, and

TABLE 2

Instruction and Control Groups' EDIT Pre-, Posttest, and Maintenance 5 and 12 Weeks Scores

Comparisons	EDIT Total	Spelling	Capitalization	Overall App	Punctuation	Substance
Pretest						
C group (8)	15.69* (6.75)	4.31* (2.22)	4.69* (1.10)	3.75* (2.36)	2.00* (2.09)	0.75* (1.31)
T group (7)	12.71* (6.26)	4.07* (1.43)	4.14* (2.61)	3.36* (1.89)	1.43* (1.88)	0.29* (0.49)
ES	0.46	0.19	0.27	0.18	0.29	0.47
ANOVA	$F(1, 14) = .775$ $p = .395^{ns}$	$F(1, 14) = .217$ $p = .810^{ns}$	$F(1, 14) = .292$ $p = .598^{ns}$	$F(1, 14) = .124$ $p = .730^{ns}$	$F(1, 14) = .306$ $p = .589^{ns}$	$F(1, 14) = .779$ $p = .393^{ns}$
Posttest						
C group (8)	13.75* (8.27)	4.00* (2.51)	3.81* (2.14)	3.63* (2.71)	2.13* (1.64)	0.31* (0.46)
T group (7)	20.21* (7.15)	5.36* (0.99)	4.57* (1.13)	4.14* (2.27)	4.07* (2.35)	2.14* (1.49)
ES	0.84	0.71	0.44	0.20	0.96	1.66
ANOVA	$F(1, 15) = 11.049$ $p = .006^{**}$	$F(1, 15) = 6.854$ $p = .022^{**}$	$F(1, 15) = .674$ $p = .428^{ns}$	$F(1, 15) = .495$ $p = .495^{ns}$	$F(1, 15) = 6.099$ $p = .030^{**}$	$F(1, 15) = 10.708$ $p = .007^{**}$
Time Period						
MP 5 Weeks						
C group (8)	11.50* (5.55)	3.13* (1.73)	3.13* (1.36)	3.25* (1.58)	2.00* (1.60)	0.00* (1.00)
T group (7)	17.36* (6.02)	4.43* (0.79)	3.71* (1.25)	3.64* (2.10)	3.86* (1.57)	1.71* (1.89)
ES	1.01	0.97	0.44	0.21	1.17	1.13
ANOVA	$F(1, 15) = 13.615$ $p = .003^{**}$	$F(1, 15) = 9.659$ $p = .009^{**}$	$F(1, 15) = 1.620$ $p = .227^{ns}$	$F(1, 15) = .558$ $p = .469^{ns}$	$F(1, 15) = 6.815$ $p = .023^{**}$	$F(1, 15) = 6.971$ $p = .022^{**}$
MP 12 Weeks						
C group (8)	15.88* (8.15)	4.00* (2.00)	4.88* (2.23)	4.00* (2.56)	1.75* (2.12)	1.25* (0.46)
T group (7)	19.14* (7.78)	4.86* (0.38)	4.86* (1.77)	3.14* (2.73)	3.57* (1.90)	2.71* (1.89)
ES	0.41	0.60	0.01	0.32	0.90	1.06
ANOVA	$F(1, 15) = 8.173$ $p = .014^{**}$	$F(1, 15) = 5.199$ $p = .042^{**}$	$F(1, 15) = .059$ $p = .812^{ns}$	$F(1, 15) = .258$ $p = .621^{ns}$	$F(1, 15) = 6.599$ $p = .025^{**}$	$F(1, 15) = 4.410$ $p = .058^{ns}$

Note. * Denotes mean values, ** $p < .05$, C group (8) = number of control group participants, T group (7) = number of instruction group participants, Standard deviations are provided in parentheses. Overall App = Overall Appearance. ^{ns} = non-significant. ES = Effect size, Cohen's d , and MP = Maintenance Probe.

substance/missing word) were also examined. For spelling, a significant difference with a medium effect size was observed in favor of the intervention group $p = .022$, $d = .71$. No significant difference was observed between intervention and control groups regarding capitalization $p = .428$, $d = .44$ and overall appearance $p = .495$, $d = .20$. A significant difference with large effect sizes was observed for punctuation $p = .030$, $d = 0.96$ and substance $p = .007$, $d = 1.66$. Table 2 provides mean values, standard deviations, p values, effect sizes, ANOVA, and ANCOVA results for the pre-, posttests, and maintenance analyses.

Maintenance. Individuals' performances on EDIT Strategy passages were collected to determine if the effects of instruction were maintained at 5 and 12 weeks. The EDIT Strategy was not reviewed prior to the collection of maintenance data. Analysis of data for maintenance was completed through a series of ANCOVAs with the pretests as a covariate. At 5 weeks, the raters' average total EDIT scoring key posttest scores for the intervention and control groups yielded significant results in favor of the intervention group with a large effect size $p = .003$, $d = 1.01$. Regarding spelling, a significant difference with a large effect size was observed in favor of the intervention group $p = .009$, $d = 0.97$. No significant difference was observed between intervention and control groups for capitalization $p = .227$, $d = .44$ and overall appearance $p = .469$, $d = .21$. A significant difference with a large effect size was observed for punctuation $p = .023$, $d = 1.17$ and substance $p = .022$, $d = 1.13$ respectively.

At 12 weeks, the raters' average total EDIT scoring key posttest results for the intervention and control groups yielded significant results with a medium effect size in favor of the intervention group $p = .014$, $d = .41$. Regarding spelling, a significant difference with a medium effect size was observed in favor of the intervention group $p = .042$, $d = 0.60$. No significant difference was observed between intervention and control groups regarding capitalization $p = .812$, $d = 0.01$ or overall appearance $p = .621$, $d = 0.32$. A significant difference with a large effect size was observed for punctuation $p = .025$, $d = 0.90$. For the error type substance, a non-significant differ-

ence was revealed with a large effect size $p = .058$, $d = 1.06$.

Discussion

There is an increase in enrollment of young adults with IDD in colleges within the U.S. Within postsecondary programs for students with IDD there is an increasing emphasis on academic coursework. These factors have bolstered the need for evidence-based instruction in the area of written expression for postsecondary students with IDD. College students with IDD can benefit from editing and revising strategies that support individuals in using existing electronic tools found in word processing programs (e.g., spell check and thesaurus). We conducted this study to examine the use of the EDIT Strategy (Hughes et al., 2010) intervention in improving the editing skills of college students with IDD. There were several research questions for this study. For our first and second research questions, "Would college students with IDD who received the EDIT Strategy correct a significantly higher number of total editing errors and respective error types compared to their peers" study results indicated that college students in the EDIT Strategy intervention group significantly outperformed the control group with the total number of editing errors and in the following respective error types: spelling, punctuation, and substance. Comparisons yielded large Cohen d , effect sizes that ranged from 1.66 to .71 for significant findings. Results for our third research question "Would college students who received the EDIT Strategy instruction significantly outperform peers in the control group in the maintenance stage" revealed that 5 weeks after the completion of instruction significant results were found for the EDIT Strategy intervention group for overall total and error types: spelling, punctuation, and substance. After 12 weeks results revealed significant results for overall total and error types: spelling and punctuation for the EDIT Strategy intervention group.

This study was the third experimental investigation of the EDIT Strategy. The first EDIT Strategy intervention conducted by Carranza and Hughes (2009) found significant improvement in middle school students with

learning disabilities' editing skills following a total of 4 hours of instruction over approximately three weeks. The second EDIT Strategy study conducted by Woods-Groves et al. (2015) with postsecondary students with IDD revealed significant improvement in students' editing skills after 13 hours of instruction over an 8 week time period. The previous investigations of the EDIT Strategy were used to inform the current study. College students with IDD in the Woods-Groves et al. (2015) investigation required an exponential increase in the number of sessions (i.e., from four sessions reported in Carranza and Hughes to 16 sessions) for each lesson in order to achieve mastery (80% criterion) of each lesson. In this current investigation we reduced the number of intervention sessions reported in Woods-Groves et al. (2015) from 16 sessions to 11 sessions. Specifically, we removed five sessions pertaining to "using the Spell check" and "guided practice with all steps." Students in the intervention group continued to practice skills pertaining to a specific lesson until they reached 80% mastery. The total duration of the intervention was 11 sessions for 5.5 weeks. As in the Woods-Groves et al. study, college students with IDD required extended intervention sessions when compared to the Carranza and Hughes' (2009) investigation with middle school students with learning disabilities. College students with IDD who received EDIT Strategy instruction in this study required additional instructional sessions, the use of graphic organizers, and multiple opportunities for guided practice with corrective feedback. The students were able to significantly improve their editing skills and maintain those skills over time (i.e., 5 and 12 weeks post-instruction).

For this study the adaptation of the pre-, posttest, and maintenance prompts were informed by a review of the previous two EDIT Strategy studies. We made an a priori decision to adapt the prompts from 25 to 30 total errors (i.e., one error type for spelling, capitalization, overall appearance, punctuation, substance). We extended the number of errors to provide further instances of errors and to increase the opportunities to measure students' editing skills. Only five additional errors were included in order to keep the length of the passages manageable for the students and to

parallel the type of passages (e.g., number of errors, length, etc.) used during instruction. Even though the cumulative EDIT Strategy intervention was shortened in this current study (8.25 hours vs. 13.3 hours) the extended dependent measure (i.e., 30 vs. 25 possible points) indicated that college students who were taught the strategy improved their overall editing performance and their performance in three editing types (i.e., spelling, punctuation, and substance) vs. the Woods-Groves et al. (2015) investigation where college students showed improvement in two editing types (i.e., overall appearance and punctuation). These findings support the use of a shorter intervention (i.e., 11 vs. 16 sessions) coupled with the revised dependent measure. This is significant due to the fact that it is necessary to determine the most efficient intervention design that can help bolster sustainable and effective use by educators and postsecondary learners with IDD.

Limitations and Future Research

There were three limitations concerning this study. The first limitation concerns the length of the intervention. Even though this investigation, in which a shorter intervention time was employed, yielded positive results for the college students who were taught the EDIT Strategy, it still required 8.25 hours of instruction and 11 sessions. Further investigations of the strategy should examine if equitable results could be found with the employment of a shorter intervention time. The second limitation pertains to the fact that the college students did not generate and edit their own responses due to the length of instruction and constraints concerning the amount of time allotted for strategy instruction. Future studies should be conducted that evaluate if college students would generalize editing skills to their own written work. The third limitation of this study is the fact that while postsecondary students with IDD acquired and successfully applied the EDIT Strategy steps in identifying and correcting spelling, punctuation, and substance errors they did not successfully apply the steps in the areas of capitalization and overall appearance. Future studies should examine aspects of intervention instruction to determine what supports are needed to bol-

ster the successful acquisition and use of the EDIT Strategy for all editing error types.

Implications for Practice

When the pre- and posttest responses of the control group were examined the number of errors corrected actually decreased. We would hypothesize that even though the students in the control group had the same access to spell check and editing tools within their electronic word documents as their peers in the intervention group it is necessary to have explicit instruction or support in using these tools to identify and correct grammatical, overall appearance, and substance errors within the electronic prompts. An important implication of this study is the fact that many of the difficulties that college students with IDD can experience in the area of written expression with regard to editing, are difficulties they may have continually encountered in upper elementary, middle school, and high school. Due to the fact that postsecondary learners with IDD in this study continued to experience difficulty in this area after they indicates that it was necessary to quickly and effectively identify strategies in the area of written expression. The EDIT Strategy could be a useful intervention for students with IDD in secondary schools. Carranza and Hughes (2009) supported the use of the EDIT Strategy for improving the editing skills of middle school students. The EDIT Strategy promotes editing and revising within an electronic format which emulates requirements of many standardized outcomes-based writing assessments such as NAEP 2011, Partnership for Assessment of Readiness for College and Careers (PARCC, 2010), and SMARTER Balanced Assessment Consortium (SBAC, 2010). An important implication based upon the success of the postsecondary students with IDD within this study and the Woods-Groves et al (2015) previous EDIT strategy investigation is the improvement in student skills in acquiring and applying the multi-faceted strategy. The results support the view that strategy instruction in the area of written expression with college students with IDD is worthy of further exploration.

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