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Research Article

The Effectiveness of Modified Multi-Component Cognitive Strategy Instruction in Expository Text Comprehension of Students with Mild Intellectual Disabilities*

Arzu Doğanay Bilgi[1]
Gazi University

E. Rüya Özmen[2]
Gazi University

Abstract

This study investigates the effectiveness of Modified Multi-Component Cognitive Strategy Instruction (MMCSI) on expository text comprehension skills of students with mild intellectual disability (ID). Three students participated from inclusion classes of three different secondary schools in Turkey. The study was conducted using a multiple probe design across subjects. Expository text comprehension skills of the students were evaluated by using two different approaches: Reading Comprehension Test and Summary Writing. Comprehension scores of the summaries were assessed according to the following dependent variables: length of the summary, main idea scores, and quality. MMCSI was implemented in four phases: text structure instruction, modeling, guided practice, and independent practice. Study results showed that MMCSI was effective in a) improving the students' comprehension of descriptive texts, b) maintaining comprehension skills, and c) generalizing these skills to texts with different topic areas and structures.

Keywords

Cognitive strategy instruction • Expository text • Intellectual disability • Intervention • Reading comprehension

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1 **Correspondence to:** Arzu Doğanay Bilgi (PhD), Department of Special Education, Gazi University, Beşevler, Ankara 06500 Turkey. Email: arzudb@gazi.edu.tr

2 Department of Special Education, Gazi University, Beşevler, Ankara 06500 Turkey. Email: ruyaozmen@hotmail.com

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With the legal amendments of 1997 in Turkey, students with disabilities began to receive teaching in general education classrooms. Consequently, individuals with mild intellectual disability (ID) are increasingly placed in general education classrooms and engaged with academic curricula (Ministry of National Education, 2017). It is intended that students with ID could gain the same academic skills in the curriculum such as reading, writing, and mathematics as their peers. However, they have difficulties in developing these basic academic skills. Effective procedures are needed to teach academic content to these students (Hudson, Browder, & Wood, 2013). However, since special education support services are limited and existing teaching is not adequate, these students cannot achieve basic academic skills (Akçamete, Gürgür, & Kış, 2003; Kalkan & Özmen, 2013; Özbay, Özmen, Tuncer, & Altunay, 2007). Moreover, since teachers' expectations of these students are low, they may not make enough effort to teach academic skills.

In Turkey, various descriptive studies have been conducted in order to assess the reading skills of children with ID. The studies show that these students have problems achieving skills such as reading accuracy, reading rate, and reading comprehension; also, they exhibit lower performance than their peers in these skills (Akçamete et al., 2013; Kalkan & Özmen, 2013; Özbay et al., 2007). Moreover, most of these students are illiterate (Özbay et al., 2007). Furthermore, it was observed that, among all student groups with various disabilities, students with ID need the highest level of support for reading and early literacy skills (Akçamete et al., 2003).

Text comprehension is a difficult skill requiring the use of many cognitive strategies (Alfassi, Weiss, & Liftshitz, 2009). A competent reader uses strategies before, during, and after reading in order to comprehend a text. For example, the reader makes predictions about the text before reading, establishes links between the important units of information while reading, and summarizes the important information after reading. In the literature available, multi-component strategies based on teaching these strategies in an integrated manner have been proven to be effective in reading (Klingner, Vaughn, Arguelles, Hughes, & Leftwich, 2004; Mothus & Lapadat, 2006). Multi-component cognitive strategy teaching has a direct focus on the strategies required before, during, and after reading. Thus, it aims at achieving students' independence in reading comprehension.

Text comprehension in particular is also a challenging skill for students with ID, who usually struggle with reading and language comprehension (Connors, 2003; van Wingerden, Segers, van Balkom, & Verhoeven, 2014). Many factors can impede a student's reading comprehension, such as failure to strategically process information and to use appropriate background knowledge while reading, lack of metacognitive awareness of learning, poor knowledge of vocabulary and common

text structures (i.e., narrative text structure, expository text structure) (Gersten, Fuchs, Williams, & Baker, 2001). Students with ID often fail to use effective memory and rehearsal strategies, and they do not spontaneously organize, chunk, rehearse or elaborate on information in ways that facilitate learning (Baddeley, 2007; Scruggs, Mastropieri, Berkeley, & Marshak, 2010). In addition, these students typically process information more slowly (Banikowski & Mehring, 1999) and fail to establish meaningful relationships among sets of ideas. Also, as poor readers, they typically lack knowledge of reading strategies and experience difficulty in monitoring their understanding (Alfassi, 1998). Various studies show that students with ID require systematic and intentional comprehension instruction (Alfassi et al., 2009; Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006). Due to these difficulties, information which students with ID can gain by reading informative texts is limited and it becomes difficult for them to reach many educational goals.

Multi-component cognitive strategy teaching is used for teaching reading comprehension to students with ID; however, there are only a few studies on the topic. In a limited number of studies on individuals with mild ID who are considered as inefficient learners, the effectiveness of comprehension instruction on expository text comprehension skills were tested (Alfassi et al., 2009; Lundberg & Reichenberg, 2013; van den Bos, Nakken, Nicolay, & van Houten, 2007). In these studies, a multi-component strategy instruction called Reciprocal Teaching, which was developed by Palincsar and Brown (1984), has been used. It consists of the following strategies: *questioning, summarizing, attempting to clarify word meanings or confusing text, and predicting what might appear in the next paragraph*.

Alfassi et al. (2009) put into practice the reciprocal teaching technique in their experimental study with students aged 15-21 with mild and moderate ID to foster their comprehension skills. Findings show that reciprocal teaching is indeed superior to traditional remedial methods of skill acquisition in fostering expository text comprehension. Van den Bos et al. (2007) worked with 38 adults aged 20-72 with mild ID to determine the effects of two instruction conditions, i.e. the strategy instruction to individuals and the strategy instruction in small groups in a reciprocal teaching context. Findings indicated that both the group and the individual instruction conditions result in growth of expository text comprehension skills of participants. In another study, Lundberg and Reichenberg (2013) investigated the effects of two different multi-component cognitive strategy instruction packages: reciprocal teaching and inference teaching on expository text comprehension skills. Participants were 40 students aged 13-18 with mild ID and were divided into two types of interventions. Results of the study show that the comprehension skills of both groups improved.

Another multi-component cognitive strategy is POSSE (Prediction-Organization-Search-Summarization-Evaluate) which was developed by Englert and Mariage (1991). It was proved to be effective in the comprehension of expository text when used with fifth and sixth grade students with learning difficulties. POSSE is formed according to the reading strategies of *reciprocal teaching*. Students employ a variety of reading strategies, such as Predicting ideas based upon background knowledge, Organizing predicted textual ideas and background knowledge based upon text structure, Searching/Summarization by searching for the text structure in the expository text and summarizing the main ideas, and Evaluating their comprehension by comparing (graphic organizers generated during the Organize and Search/Summarize phases were compared), clarifying (attempting to clarify word meanings or confusing text), and predicting (predicting what might appear in the next paragraph). In the teaching process of POSSE, direct teaching of text structure is not provided; instead, teachers enable students to observe the text structure while teaching strategies to organize ideas predicted before reading and to use a graphical organizer during reading (Mariage, 1994).

There is only a limited number of studies on the use of multi-component cognitive strategy teaching for teaching reading comprehension to individuals with ID; yet there are also some studies on problem solving in mathematics (Chung & Tam, 2005) and on writing (Güzel-Özmen, 2006; Özmen, Gürel, & Şimşek, 2015; Konrad, Trela, & Test, 2006). Some of these studies reduce cognitive strategies (Chung & Tam, 2005) and some adopt a staged presentation (role-modeling, guided practice, and independent practice) in which the procedural facilitators are gradually withdrawn in order to achieve student independence. With such modifications, teaching accommodates the learning characteristics of students with ID and seeks to encourage student independence in using academic skills.

This was the background and the challenge for us in investigating the opportunity of developing a multi-component cognitive strategy instruction package for reading comprehension instruction for students with ID. With this in mind, this study investigates the effects of using a modified POSSE, which is a multi-component strategy in developing reading comprehension skills, on the expository text comprehension of students with ID. The modification of POSSE was made by taking into account the characteristics of students with ID in order to teach the strategies explicitly and more systematically, and to have students gradually implement the strategies more independently. It consists of text structure instruction and *before, during, and after reading* strategies.

In MMCSI, similar to the teaching procedure of POSSE, there are think-sheets and graphical organizers to support students in a structured and methodical way

during each stage of the comprehension process. One of the main differences between MMCSI and POSSE is that the former includes direct instruction in text structure. In MMCSI, the criterion to initiate reading strategies with students with ID is that s/he has achieved the text structure knowledge. Another characteristic of MMCSI is that it is presented by taking into account the instructional characteristics of the *Self-Regulated Strategy Development* approach. Instructional phases of this approach include modeling, guided practice, and independent practice, and a criterion is set for the transition to the next phase (Graham & Haris, 2005). MMCSI is also designed by considering these different instructional phases and implementing it based on the criteria. These modifications are made by taking into account the characteristics of students with ID in order to teach the strategies explicitly and more systematically, and so that the students can implement the strategies in an increasingly independent way.

The purpose of this study is to investigate the effectiveness of MMCSI based on the following skills of students with ID: a) comprehension of expository texts, b) maintenance of comprehension, and c) generalization of texts of the same type but with a different structure and topic. If MMCSI is proved to be effective in supporting comprehension skills, changes in the traditional methods of teaching reading comprehension to students with ID may be recommended.

Method

Participants and Settings

Three students, one girl with borderline deficiency in intelligence and two boys with mild ID, participated in the study. The participants were selected from among fifth to eighth grade students from public schools offering general education and were also enrolled in a special education center in the Ankara province of Turkey. Students received two hours of remedial education services in reading, writing, and mathematics courses two days a week at this center. Individualized Education Programs for each of these students had goals for improving reading comprehension, writing, and mathematics skills.

Selection criteria were identified in terms of the reading skills of the students participating in this study. These were: a) reading texts appropriate for students in fifth to seventh grades with 90% accuracy (Lerner, 2000; Mercer & Mercer, 2005), b) reading 60 or more words per minute, and c) correctly answering a minimum of two or a maximum of five out of 13 literal questions in a 350 (+/-20) word descriptive text. This ensured that reading would not be a crucial impediment in learning the reading strategies that would be provided during the study. To identify the participants, teachers of fifth to eighth grade students were interviewed. At the end of these interviews, 18 students with reading comprehension problems were identified

with guidance from the teachers. These students were tested to determine whether they met the prerequisite conditions or not. During the assessment, students' reading accuracy, and comprehension performance were measured using descriptive texts appropriate to their grade levels. Finally, 3 out of 5 students who met the prerequisite skills were randomly selected as study participants.

The first participant was a female fifth-grade student aged 12. Her full-scale score on the Turkish version of the Wechsler Intelligence Scale for Children (WISC-R; Savaşır & Şahin, 1994) was 73. She could read 63 words per minute with 95% accuracy, and she correctly answered four of the 13 comprehension questions.

The second participant was a male seventh-grade student aged 13. His full-scale score on the Turkish version of the WISC-R was 69. He could read 73 words per minute with 95% accuracy, and he correctly answered four of the 13 comprehension questions.

The third participant was a male seventh-grade student aged 13. His full-scale score on the Turkish WISC-R was 58. He could read 65 words per minute with 90% accuracy, and he correctly answered five of the 13 comprehension questions.

The present study took place in a 10 square meter individual training room in the special education center. The room was equipped with a table and two chairs and with no distracting stimulus. The sessions were recorded using a video camera.

Materials

Developing descriptive text structure and texts. A descriptive text, a type of expository text, was used in the study. In order to eliminate possible use of background knowledge while answering text-related comprehension questions, the topic chosen for the text was wild animals, something which does not exist in the immediate environment of the students. To develop the texts, a structure was developed according to the features of the descriptive text. To develop the text structure, books, encyclopedias, and websites on animals were scanned. The resources were examined according to the characteristics of animals and the types of information. Then, the collected information was classified, labeled, and arranged to form the text structure. The finalized text structure consists of six parts: a) the audience to be addressed, b) the life of the animals, c) their physical properties, d) their eating habits, e) their reproduction, and f) their benefit/harmfulness to humans and/or nature and the animal population. Consequently, there were ten sub-parts: the places animals live, lifestyles, body types, the functions of the body parts, the food the animals eat, the forms of food gathering, reproduction, child care, benefit/harmfulness to humans and/or nature, and the animal population. Three experts from the Turkish Language

Education program were consulted on the appropriateness of the parts of the text structure and their labels and sequencing. They were asked to evaluate the texts according to a) appropriateness of the sections of the expository text structure, and b) appropriateness of section labeling and sequence. The text structure was revised and finalized based on their opinions.

Twenty-five texts were written according to the text structure. The average passage length was 350 (+/-20) words. The texts were written using Times New Roman font with 1.5 line spacing and 12-point font size. The Readability Formula for Turkish was applied to the texts (Çetinkaya, 2010), readability of the texts was found to be "independent," and texts were appropriate for students in the 5th to 7th grades. The texts were reviewed by the same experts who evaluated the text structure. They were asked to evaluate the texts considering the appropriateness of the text structure, content integrity, text coherence, and inter-sentence cohesion, narration, vocabulary, title, and grammar rules. The texts were then corrected and revised based on their suggestions. The descriptive texts were randomly selected for all experimental conditions. The same texts were used for the three students during the assessment and instruction sessions.

Developing generalization text structure and generalization texts. To assess generalization, texts introducing a geographical place were used. Before composing the generalization texts, a text structure was formed. Processes similar to those used for the wild animal texts were followed to develop the generalization texts. The generalization text structure is composed of six parts: a) the audience that is addressed, b) the location of the geographical area, c) its formation, d) its features, e) its living conditions, and f) its effects on humans and the environment. These parts are detailed by the following eight sub-parts: the location on Earth, definition, formation, features, living conditions, living things, the effects on humans or/and the environment, and the effect of global warming on this location. Eight generalization texts were written to introduce glaciers, deserts, volcanoes, rainforests, oceans, swamps, lakes, and rivers. The Readability Formula for Turkish was applied to the texts (Çetinkaya, 2010), readability of the texts was found to be "independent," and texts were appropriate for students in the 5th to 7th grades. Three experts from the Turkish Language and Geography Education programs were consulted on both text structure and generalization texts. They were asked to evaluate the texts considering the same criteria used for descriptive text structure and texts. The generalization text structure and texts were revised based on their suggestions. Texts were 350 (+/-20) words and were written using Times New Roman font with 1.5 line spacing and 12-point font size.

Developing the reading comprehension tests. Two different reading comprehension tests were developed for descriptive texts and for generalization texts. These were used during pre-instruction, instruction, post-instruction, and

maintenance. While reading, comprehension questions were developed; each text was analyzed considering the text structure. Important units of information in the text were identified, and appropriate questions and answers were developed. Finally, 13 open-ended literal questions and 3 open-ended inference questions were developed for each text. Moreover, 10 open-ended literal questions on the information units in the generalization texts were developed. To receive expert opinion, the comprehension questions and texts were given to three experts at the Department of Turkish Language. They were asked to complete a reading comprehension questions assessment form addressing the following: a) the formation of the questions, b) the direct availability of the answers to the questions within the passage (for the literal questions), c) the availability of questions with respect to all elements that would assist in comprehending the passage, and d) the conformity of inferential questions. Based on their suggestions and feedbacks, the questions were revised.

Experimental Procedure

In the study, the effects of MMCSI on expository text comprehension skills were assessed through the use of multiple probe design across subjects (Gast, 2010). The instruction was provided by the first researcher, who also administered all experimental procedures. To guide the instruction process, instructional plans were developed for each phase. MMCSI was applied in four phases. In the first, the *text instruction phase,* the tools and the text analysis skills for understanding the descriptive text structure were provided. In the second, the *modeling phase,* the researcher modeled the reading strategies for the students. The third phase, *guided practice,* was an interactive phase in which the researcher guided use of strategies and offered feedback. In the fourth phase, students worked independently. The data regarding number and length of the sessions are provided in the following paragraph.

Text structure teaching was completed in 4 sessions for each of the subjects. MMCSI's modeling phase was completed over 2 sessions for the first subject and 3 sessions for the second and the third subjects. Guided practice was completed over 3 sessions for the first subject and 2 sessions for the second and third subjects; independent practice lasted 2 sessions for all subjects. During the experiment, 11 sessions of instruction were provided in total for each student. The experimental procedure was completed over six months. During the experimental procedure, the researcher met each student individually three times a week. One session was conducted per day, and each session continued until instruction was complete. For sessions longer than 45 minutes, a 15-minute break was provided, and then the session continued. For each participating student, the three stages of text structure instruction, i.e. introduction of text structure, comparison, and text evaluation, lasted 22 to 24 minutes, 33 to 47 minutes and 18 to 20 minutes, respectively. The modeling phases lasted 2 hours 9 minutes to 2 hours

43 minutes, the guided practice phases lasted 1 hour 13 minutes to 2 hours, and the independent practice phases lasted 1 hour 10 minutes to 1 hour 37 minutes. The total instructional times for the first, second, and third students were 15 hours 57 minutes, 14 hours 30 minutes, and 14 hours 25 minutes, respectively.

Experimental procedures for each condition are provided below:

Baseline. During the baseline, the participating students' pre-instruction response rates on their reading comprehension of descriptive texts were established. Collection of the baseline probes was initiated with one probe for each student and started with the first student. This assessment was continued at least three times until the baseline data stabilized in consecutive sessions. After stabilization of the baseline data, instruction was given. While post-instruction probes were administered to the first student, baseline probes of the second student were collected. An identical procedure was applied to the third student. During the collection of baseline probe data, students were requested to read the given text silently first and then out loud. Then, a written summary of the text was requested, and finally, the given text was taken away and all questions related to the text were asked sequentially to the students.

Generalization baseline. Following the procedures established during the baseline, three baseline probes for the first and the second students and four baseline probes for the third student were administered.

Modified Multi-Component Cognitive Strategy Instruction. MMCSI was implemented in four phases: text structure instruction, modeling for strategy usage, guided practice, and independent practice.

Text structure instruction was implemented in three stages: the introduction of the text structure, the comparison stage, and the text evaluation stage. During the introduction of the text structure stage, the researcher explained the rationale for descriptive text writing and showed parts as well as sub-parts of the text structure using a graphic organizer. This stage lasted for one session. The comparison stage was conducted over two sessions. In this stage, the researcher read the sample text and compared it to the text structure. She read each paragraph individually, underlined information units, keywords and/or sentences about the main ideas, and wrote a description representing the main idea (i.e., labeling) on each paragraph. The student was asked to do the same for her/his texts. In the text evaluation stage, descriptive texts that were appropriate to the structure were assigned to the students. The students were asked to underline the important information units while reading, to write the labels that showed the main idea on the paragraphs, and to decide whether the text was appropriate for the text structure. Identifying the text using the appropriate text structure was a criterion for the transition from this stage to the strategy instruction stage. The students accomplished this criterion in one session with one text.

Before, *during*, and *after reading* strategy instructions within the MMCSI framework were conducted. These strategies included a) setting a goal for reading and motivating the students, b) activating background knowledge of the topic and predicting the text content, c) placing the predicted ideas on a graphic organizer for *before reading*, d) defining important information units in the text and placing them on the graphic organizer for *during reading*, e) comparing predicted ideas with ideas in the text, and f) writing a summary of the text for *after reading*.

During the *modeling phase*, all strategies were modeled holistically. Furthermore, several procedural facilitators were used in this stage. Before reading, a "reading goal think-sheet" was used to support purposeful reading and increase reading motivation. The researcher answered the following questions on the think-sheet: "Why am I reading? How will this text help me? How should I read to better grasp the meaning?" For the *background knowledge activation* strategy instruction, a "prediction think-sheet" was utilized. The questions on this sheet were "What is the title of the text? Which animal is the text about? What do I know about this animal?" In this stage, the researcher set the topic by reflecting on the title and made predictions about the animal that was introduced. Then, *transforming brainstormed ideas onto a graphic organizer* strategy instruction was conducted. In this process, the researcher grouped and labeled the brainstormed ideas on a prediction schema. During reading, the researcher underlined the important information units, classified these on a semantic map, and labeled the groups. After reading, ideas about the prediction schema and semantic map were compared. Finally, the researcher summarized the text by looking at the semantic map and following the order of the text structure. Keywords that fitted the descriptive text structure were used to write the summary. During these stages, the researcher first modeled the strategy and then asked the students to do the same. Interactive dialog took place during strategy instruction, and the strategy use was modeled using the think aloud technique. The criterion for transition from the modeling stage to the guided practice stage was the student's ability to list the MMCSI strategies in sequence. The first student met this criterion in two sessions, the second and third students met this criterion in three sessions.

The *guided practice phase* required students to perform all strategies used in *before*, *during*, and *after reading*. They were guided and given prompts and feedback when needed during practice. The researcher guided the preparation and use of three think-sheets and two graphic organizers for strategy instruction. The criterion for transition from guided practice to independent practice was the student's independent implementation of the strategies. The first student achieved this criterion in three sessions, whereas for the second and third students, it took only two sessions.

Independent practice encouraged students to practice independently. However, corrective feedback was provided when necessary. The criterion for completion was writing a summary including all components. All students met this criterion in two sessions.

Instruction began for the first student after establishing a stable baseline in terms of a correct answer rate for reading comprehension questions. Instruction continued until the first student demonstrated mastery of the strategies included in MMCSI. Baseline probe data for the second student was gathered after the first student's reading comprehension performance increased at least two and a half times of the baseline probe data. Identical procedures were applied to the third student.

Post-instruction. After completion of the instruction, at least three post-instruction probes were administered by following the procedures established during the baseline.

Generalization instruction. Before assessing the comprehension skills of the students regarding generalization texts, one session was conducted on using MMCSI on generalization texts and generalization text structure was introduced to students. During this session, a text that presented a geographical area was taught according to the modeling phase of the strategy implementation. The generalization text structure was presented to the students and modeled using the strategies during approximately one hour of instruction. During this session, other than setting a goal for reading and motivating students for *before reading* and writing the summary of the text for *after reading* strategies, all strategies were implemented.

Generalization post-instruction. At this stage, it was intended to determine the efficiency of MMCSI on students' comprehension of generalization texts. "Post-instruction assessment on generalization" data were collected in the same way as applied at the generalization baseline phase. At the end of the instruction, two pieces of "post-instruction assessment on generalization" data were collected for each student.

Maintenance. Three to twelve weeks after the completion of instruction, maintenance and assessment were administered as in the baseline over three sessions for each student.

Generalization maintenance. After two to eight weeks, an assessment of generalization maintenance was administered as in the baseline assessment. Collection of the generalization maintenance data was conducted over two sessions for each student.

Reliability of Instruction

To help ensure the reliability of instruction, all sessions were recorded and random reviews of at least 33.33% of all sessions, which covers at least one of each type of instructional session, were conducted for each student. An independent special education teacher, who was not involved in the research, watched each recording and compared it with the instructional script. The percentage of agreements versus disagreements was calculated, and an average of 99.79% (98.18% to 100%) agreement was obtained for each student for all sessions.

Data Collection and Scoring

In order to collect data in this study, students were asked to read the text silently first and then out loud. During the assessment, the students were given the instruction that they could take notes however they wanted and they could underline anywhere on the text to aid their understanding. Having read the text, the students were asked to write a summary of the text. During this process, the texts were kept on the students' desks where they could see them. After completing the summaries, the texts were taken away and comprehension questions were asked verbally.

Summarizing. Summaries were scored based on length, main idea, and quality.

Length of the summaries. All words, including the title, were counted, except for repeated words within a sentence.

Main idea scoring. The main ideas in the summaries were scored according to the parts in the text structure and its sub-parts. The main ideas in each summary text structure and its details were considered for scoring (Mateos, Martin, Villalon, & Luna, 2008). The main ideas were scored from 0 to 2. Detailed main ideas were given 2 points, less detailed and informative main ideas were given 1 point, and components stated in the text but not in the summary were given 0 points. Based on this scoring system, a student could receive a minimum of 0 and a maximum of 20 points for the summaries and a minimum of 0 and a maximum of 16 points for the generalization summaries.

Quality scoring. A holistic scoring method was used to score the quality of the summaries (Graham & Perin, 2007; Saddler & Asaro, 2007). Summaries were scored from 1 to 7 in terms of idea generation, non-textual information, appropriateness of structure, word choice, and sentence structure. Considering the grade levels of the students, scoring was based on samples from the typical development of fifth-grade student summaries. Of these samples, summaries of 2, 4, and 6 points were used as a basis for assessment.

The comprehension tests. During scoring, answers which included the same wording as in the texts, or students' own sentences phrased in such a way to reflect the correct answer, were scored as correct; other answers were scored as wrong. Students were given 1 point for every correct answer and 0 for wrong answers.

Data Analysis

Data collected by single-subject research designs is analyzed through interpreting data graphically according to data levels and trends (Gast, 2010). In this study, the level of the data path in the baseline is compared to the levels of the data path during the instruction phases and after the instructions.

Interobserver Integrity

In this research, interobserver integrity of the data collected for both reading comprehension and summary skills was calculated. For the comprehension test, interobserver integrity was measured for the correct answers given to the test by two special education teachers serving as independent observers. At least 33.33% of the video recordings with a minimum of one experimental condition for each student were assigned to the raters. The scoring criteria were given to the raters, and then video recordings of the comprehension test were provided for the assessment of the students' answers considering the correct answer rate. In this study, the interobserver integrity for each text was calculated separately. Interobserver integrity for the reading comprehension test was 98.94% on average (96% to 100%).

For the summaries, interobserver integrity was measured for the word count of the summaries, the main idea scores, and the quality of the summaries by the first researcher and a special education program graduate student serving as a rater. At least 30% of the summaries and a minimum of one experimental condition were assigned to the rater. The rater received one hour of training in using the scoring criteria. First, the words to be included in and excluded from the word counts were clarified. Second, the text structure guiding the main idea scoring was introduced, and main ideas were shown on a sample text. Finally, the criteria regarding quality were explained, and scoring for quality on a text was exemplified for holistic assessment. The rater was given reference summaries by students with typical development for the student summaries, reference texts, text structure, and holistic assessment. The rater was asked to identify the word count, the main idea scores, and the quality of the summaries. Again, the interobserver integrity was calculated separately for each summary. Interobserver integrity for the summary length was 99.4% on average (97.5% to 100%). The average was 98.6% for main idea points (80% to 100%). Lastly, for the quality of the summaries, the average was 99.2% (85.2% to 100%) reliability.

Results

Summarizing

Summaries of descriptive texts were assessed according to the following dependent variables: Length of the summary, main idea scores and quality. Table 1 displays the word counts of the summaries written during the baseline, post-instruction, maintenance, and generalization conditions. As seen in the table, students summarized the 350-word (+/-20) descriptive text on animals with an average of 31.5 to 53.5 words at the baseline stage. The length of the summaries dramatically increased in the post-instruction stage compared to the baseline. In the post-instruction stage, the students' summary length reached an average of 144 to 207.3 words. The length increased to

an average of 153.8 words for the first student, 106.3 words for the second student and 127.8 for the third student. The students maintained these increases in length, with an average of 129 to 207 words during the maintenance sessions. A decrease was observed during the sixth- and twelfth-week maintenance sessions only for the second student, who summarized the texts using 114 words in the sixth week and 110 words in the twelfth-week. This performance in the last maintenance session was similar to that of the post-instruction assessment.

The length of the generalization text summaries changed significantly after instruction (see Table 1). The students summarized a 350-word (+/-20) descriptive text on a geographical area with 27.5 to 36 words during the baseline. After instruction, students wrote summaries with an average of 130 to 163 words. The increases in summary length on average for each student were as follows: 127 words for the first student, 96.4 words for the second student and 125.8 for the third student. Students wrote longer summaries with 108 to 182 words during the maintenance sessions.

When main idea scores under the baseline, post-instruction and maintenance conditions are considered, it can be observed that all students received low points for the main ideas in the written summaries during the baseline (see Table 1). The baseline scores ranged from 2.6 to 4.5 (the maximum possible score was 20 points). The post-instruction scores were 18.6 to 20 points on average. The main idea scores during the baseline increased 4.4 times for the first student, 6.2 for the second and 7.4 for the third. The maintenance scores were similar to the post-instruction scores. The students' main idea scores averaged 19 to 20 in the maintenance sessions. These findings show that the students maintained their post-instruction performance in the maintenance sessions.

Table 1 also displays the main idea scores generated from the written summaries for the generalization baseline, generalization post-instruction and maintenance conditions. The students' average quality scores ranged from 1 to 1.5 (the maximum possible score was 16 points). Their average main idea score was 16 in post-instruction. The main idea scores increased 16 times for the first and second students and 10.6 times for the third student. The students displayed similar performances in the maintenance conditions.

Finally, when the quality scores of the summaries written during the baseline, post-instruction, maintenance, and generalization conditions are considered, it can be observed that all students wrote low-quality summaries during the baseline (see Table 1). Their baseline quality scores ranged from 1.0 to 1.3. The students' quality scores improved dramatically during the post-instruction. On average, the first and third students' scores were 7, and the second student's score was 5.33. The quality scores of the summaries during the baseline increased 5.6 times for the first student, 7 times for the second student and 5.26 times for the third student during the post-

instruction. The students' maintenance probes remained nearly identical to the levels obtained post-instruction.

Similar results were obtained for the quality of the generalization text (see Table 1). All students were ranked as 1 for the quality of their summaries at the baseline. After the instruction, the first and third students received scores of 7, whereas the second student received a 5 for all sessions. The quality scores of the summaries increased 7 times for the first and third students and 5 times for the second student.

Table 1
Summarizing Measures

Summarizing Measures	*Student 1*					*Student 2*					*Student 3*				
	B	*P1*	*M1*	*M2*	*M3*	*B*	*P1*	*M1*	*M2*	*M3*	*B*	*P1*	*M1*	*M2*	*M3*
Word Count of Summaries	53.5	207.3	224.0	228.0	169.0	37.7	144.0	163.0	114.0	110.0	31.5	159.3	183.0	184.0	168.0
Word Count of Generalization Text Summaries	36.0	163.0	187.0	177.0	----	33.6	130.0	126.0	91.0	----	27.2	153.0	172.0	178.0	----
Main Idea Scores of Summaries	4.5	20.0	20.0	20.0	20.0	3.0	18.6	20.0	19.0	20.0	2.6	19.3	20.0	20.0	19.0
Main Idea Scores of Generalization Summaries	1.0	16.0	16.0	16.0	----	0.0	16.0	16.0	12.0	----	1.5	16.0	16.0	16.0	----
Quality Scores of Summaries	1.2	7.0	7.0	7.0	7.0	1.0	5.3	6.0	5.0	6.0	1.3	7.0	7.0	7.0	7.0
Quality Scores of Generalization Summaries	1.0	7.0	7.0	7.0	----	1.0	5.0	6.0	5.0	----	1.0	7.0	7.0	7.0	----

Note. B = Baseline, P1 = Post-Instruction, M1= First Maintenance, M2 = Second Maintenance, M3 = Third Maintenance.

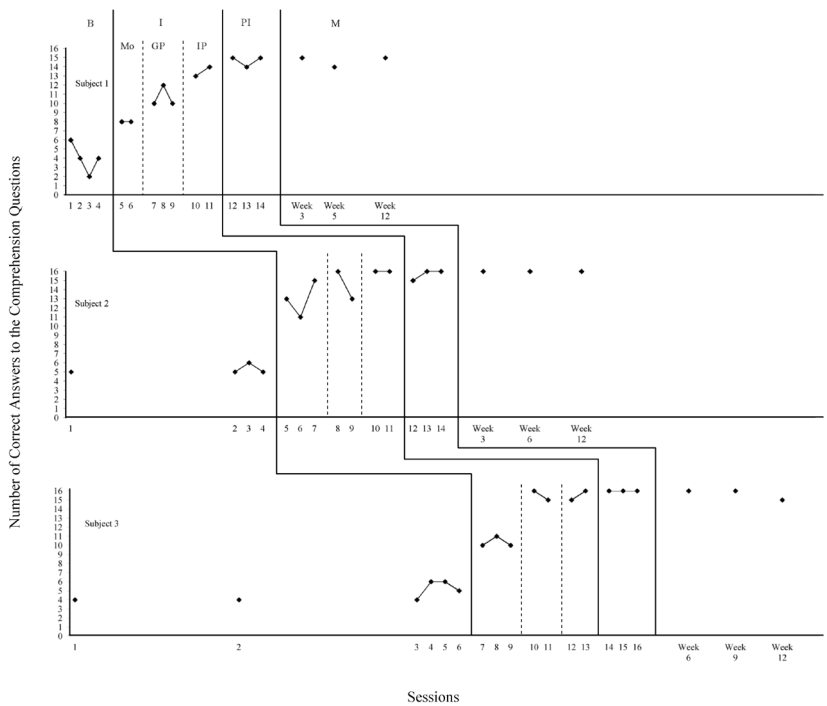
Reading Comprehension

In Figure 1, the number of students' correct answers for the questions in the comprehension test in baseline, instruction, post-instruction, and maintenance sessions are given. The number of correct answers of all students for the comprehension questions in the baseline is very low. In the baseline, the first, the second, and the third students had at least 2, 5, and 4 correct answers respectively, whereas they had at most 6 correct answers out of 16 questions.

The number of correct answers for the comprehension questions in the modeling, guided practice, and independent practice sessions of MMCSI are also given in the same graphic. The first student had 8 correct answers at the end of both modeling instruction sessions. At the end of guided practice sessions, she had 10, 12, and 10 correct answers, respectively, whereas she correctly answered 13 questions at the end of the first session of independent practice and 14 questions in the succeeding session. The second student answered 13, 11, and 15 questions correctly at the end of the modeling sessions. He had 13 and 16 correct answers, respectively, at the end of the first and the second sessions of guided practice, whereas he correctly answered

all 16 questions in both sessions of independent practice. The third student had 10, 11, and 11 correct answers, respectively, at the end of the modeling sessions. At the end of both guided practice and independent practice, he correctly answered at least 15 but at most 16 questions. All students' number of correct answers to the questions in the comprehension test gradually increased during the instruction of modeling, guided practice, and independent practice. As can be seen in the graphic, the data curves collected during the MMCSI conditions for all three students showed a level of differentiation which gradually increased.

At the end of three sessions of instruction, the first student correctly answered 14-15 questions, the second 15-16 questions, and the third all of the 16 questions in the comprehension test. Compared to the baseline, the number of correct answers to the comprehension test in post-instruction increased 3.6, 3, and 3.13 times more for the first, second, and third students, respectively. Follow-up data showed similar results to the post-instruction data. The students correctly answered 14 to 16 questions of the comprehension test in the follow-up assessments conducted 3 to 12 weeks after instruction. These results showed that the students maintained their comprehension performance of post-instruction in the follow-up sessions.



Note: B= Baseline, I= Instruction, Mo= Modeling, GP= Guided Practice, IP= Independent Practice, PI= Post-Instruction, M= Maintenance

Figure 1. Number of Students' Correct Answers to the Comprehension Questions.

This study also demonstrated that students generalized their comprehension skills to texts which were written in the same type but using a different structure and topic. The number of students' correct answers in the comprehension test, which included 10 literal questions, in the generalization conditions is shown in Figure 2. The first student had correctly answered only 1 question during all sessions in the baseline. During the baseline, the second student had correctly answered at least 2 but at most 3 questions, and the third student had correctly answered at least 1 but at most 3 questions. At the end of the instruction, students' correct answers to the questions increased from 8 to 10. After completing the generalization instruction, the number of correct answers to the inference questions increased 8 times, 4 times, and 8 times for the first, second, and third students respectively in comparison with the baseline. Generalization follow-up data showed similar results to post-instruction results. The number of correct answers given by students in the follow-up sessions was 8 to 10.

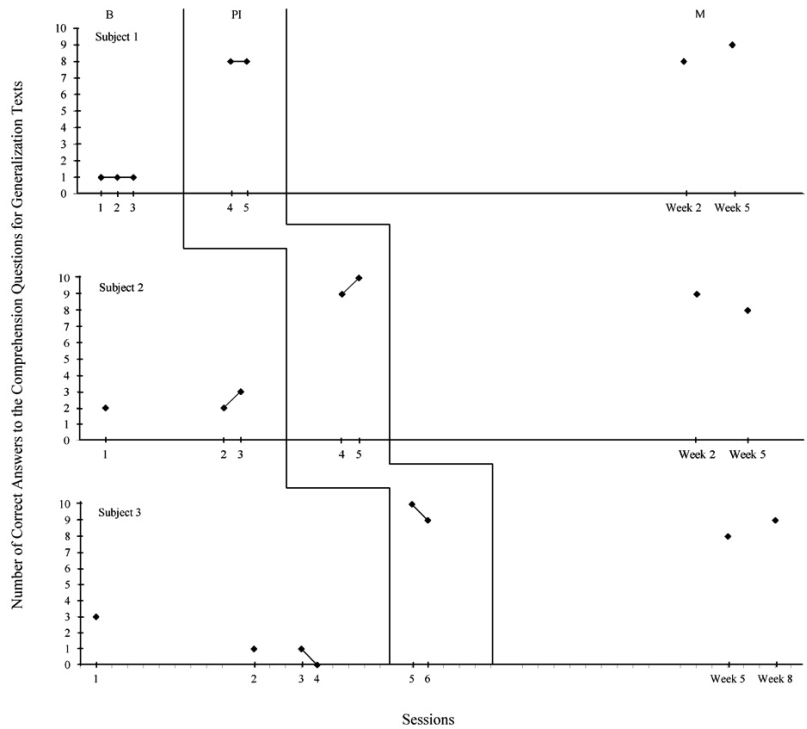


Figure 2. Number of students' correct answers to the comprehension questions for generalization texts.

Discussion

In this study, the effectiveness of MMCSI on the following skills of students with ID was examined: a) comprehension of expository texts, b) maintenance of

comprehension, and c) generalization of texts which are written in the same way but with a different structure and topic. In addition to these, assessing progress in students' comprehension in different phases of the strategy instruction was also examined. Findings of the study are discussed in the following paragraphs.

First, the study revealed that the lengths of the summaries of all three students were short and of low quality during the baseline, so the main idea scores were low. After the implementation of MMCSI, the text length increased 3.81 - 5.05 times, the main idea scores increased 4.4 - 7.4 times, and the quality scores of the summaries increased 5.26 - 7 times compared to that of the baseline. The increases in the scores for the main idea and quality demonstrate that the students composed well-written summaries reflecting the main text. The findings of the study indicate that cognitive strategy instruction contributes to the comprehension skills of students with ID.

Second, it can be observed that there was a significant difference in the number of correct answers of students in the questions of the comprehension test at the end of instruction compared to the baseline. These findings are consistent with the results of research studies in which multi-component cognitive strategies were used to enable students with ID to achieve comprehension skills (Alfassi et al., 2009; Lundberg & Reichenberg, 2013; van den Bos et al., 2007). In a recent meta-analysis study, Kaldenberg, Watt, and Therrien (2015) summarized 20 research studies on addressing improvement of expository science text comprehension of students with learning disabilities (reported between 1980 and 2012) and reported an unweighted mean effect size of 0.98 increase in students' reading comprehension of science texts, and 0.64 for multi-component comprehension strategies. The current study also shows that combining text structure instruction and multiple strategies in an instructional framework in the course of the reading comprehension process is effective on the expository text comprehension of students with ID. Moreover, results indicate that providing text structure instruction and reading strategies simultaneously has a powerful effect on students' reading comprehension.

Third, findings showed that the number of students' correct answers to the comprehension questions gradually increased during modeling, guided practice, and independent practice phases of MMCSI. As the students learned how to use the strategies, and when they used them more independently, their comprehension skills also improved. In the course of strategy instruction, while modeling the processes of *before*, *during*, and *after reading* strategies, how and when to use these strategies was also taught. It is thought that, during modeling, students paid more attention to the implementation process of the strategies rather than trying to comprehend the information in the text. Therefore, the number of correct answers to the comprehension questions during the modeling phase was less than during the guided practice and

independent practice phases. In the course of the guided practice phase, students started to implement the strategies on their own and their comprehension performance became better than their performance observed during the modeling phase. In the independent practice phase, students internalized the strategies and started to implement them independently. When students started to use the strategies independently, as they had learned how to understand a text, more progress in their performance was observed when compared to the modeling and guided practice phases.

Knowledge of text structure is important because it helps readers organize the content. It allows the processing and construction of a mental representation, that is, the meaning of the text (Williams, Hall, & Lauer, 2004). In this study, differently from POSSE, direct teaching of descriptive text structure was provided before teaching the strategies. Text structure teaching lasted four sessions and included introducing the text structure, reading the text and then comparing it with the structure, and assessing the text phases. As stated in the introduction, students with ID have difficulties in grouping and associating information (Baddeley, 2007; Scruggs et al., 2010). The reason for teaching text structure before teaching strategies was that the students would have had difficulties with skills such as ordering and grouping information. During the teaching of strategies, predicted effects of this differentiation were confirmed. During instruction, students were observed using text structure awareness and text structure knowledge while implementing *before*, *during*, and *after* reading strategies. In the course of pre-reading, students utilized knowledge of text structure to predict what would happen in the text, to form graphical organizers, to group predicted ideas, and to assign categories to these grouped ideas. During reading, students utilized knowledge of text structure to identify important information units in the text, to form graphical organizers, to group information which they drew out from the text, and to assign categories to these grouped ideas. In the course of post-reading, during the process of implementing the comparison strategy, it was observed that the students who had seen the categories were able to compare the ideas in the text with their predictions of what would be in the text by matching correct categories. As a fourth finding, teaching text structure played a supportive role to help students develop text structure awareness and implement the reading strategies. This awareness led to students using the strategies correctly. Moreover, during the assessments in independent practice and after the teaching of the strategies, it was observed that the students predicted the comprehension and inferential questions to be asked. This showed that they a) recognized the text structure, b) achieved a descriptive type of text structure knowledge, and c) utilized text structure knowledge to comprehend the text. In addition to this, summaries written during post-instruction included elements of text structure and the information units were provided in the same order as given in text. These elements are strong indicators that the students acquired knowledge of the text structure.

Fifth, the strategy of identifying the important information units during reading contributed to students' identification of the main idea and the deletion of redundant ideas. Furthermore, knowledge of the text structure facilitated the acquisition of this strategy. The increased number of words used in summaries as well as the growth in the main idea and quality scores are indicators that the students included the important ideas in their summaries.

Sixth, giving instruction in strategies during modeling, guided practice, and independent practice phases as provided in the *Self-Regulated Strategy Development* approach, and identifying criteria to transition to the next phase, made it possible to teach the strategies explicitly and more systematically. This led the students to gradually become more independent in implementing the strategies. Moreover, the instruction was based on criteria rather than time. From one instructional phase to the next, students need to have competence in the strategy which has been taught (Güzel-Özmen, 2006). In the current study, criteria which were identified to transition from one phase to the next helped the students to achieve particular competence in the strategies which were taught. Using the *Self-Regulated Strategy Development* approach with a multi-component strategy package was a new method that should be taken into consideration given its confirmed outcomes.

Lastly, the findings of this study showed that MMCSI was effective in having students with ID maintain their comprehension skills of information units, which were included in descriptive texts, 3 to 12 weeks after completion of the instruction. One of the most important purposes of teaching strategies is to ensure long-term maintenance of skills by allowing the students to become independent in their implementation of the strategies (Güzel-Özmen, 2006; Harris, Graham, & Pressley, 1992). Results of studies using multi-component strategy instruction showed that students with ID maintained their comprehension skills for a long time (Van den Bos et al., 2007). Findings were consistent with previous research and long-term effects of instruction in strategies on the comprehension skills of students with ID were proved in this study.

Another purpose of teaching strategies is to help students to make generalizations regarding different situations in the long term (Englert & Mariage, 1991; Harris et al., 1992). This study also showed that students generalized their comprehension skills when reading texts which were written in the same type but using a different structure and topic, and their generalization skills were maintained 2 to 8 weeks after instruction.

Observations which were made during the implementation of the strategy are thought to guide those who put it into practice. First, it was observed that instructional sessions of guided and independent practice were very long. The reason for this was that instead of using key words with graphical organizers, students wrote long

sentences about what they had understood from the text during reading. Therefore, teaching summarization before instruction by using key words that might aid the recall of sentences would shorten the process. Second, teaching the names of the strategies and considering it as a criterion played an important role in developing metacognitive operational knowledge during comprehension (Doğanay-Bilgi & Özmen, 2014). Third, teaching *before*, *during*, and *after reading* strategies in harmony and simultaneously made students understand that comprehension is a process. Fourth, awareness of text structure enabled the students to use the strategies more easily. Finally, criterion-based teaching and staging the phases as modeling, guided practice, and independent practice made students gradually take over responsibility for their learning and become independent in using the strategies.

This study has some limitations that should be taken into consideration in future studies. The small sample size limits the ability to generalize the conclusions that can be drawn from the present study. Therefore, the results need to be replicated using large samples of students with ID showing similar prerequisite skills. Since the instructional strategies applied during the study were delivered in a one-on-one format, conclusions about their effectiveness for teaching students in small or large group settings could not be made. Also, it was suggested that future studies should use texts from typical textbooks.

As stated in the introduction, structured and systematic instructions are required for students with ID. Therefore, it is suggested that teachers should a) structure the instruction processes at modeling, guided practice, and independent practices phases as given during MMCSI, b) define transition criteria between instruction stages, and c) teach text structure before teaching strategies. In conclusion, teachers must consider the need for explicit, systematic reading instruction for students with ID. The results of this study also support this fact and show that implementation of modified reading strategies increase expository text comprehension skills of students with ID. It is believed that this study will lend support to future research that will address the development of reading comprehension in individuals with ID, with an alternative approach which uses multi-component strategies.

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