Story Mapping and Its Effects on the Writing Fluency and Word Diversity of Students with Learning Disabilities

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Students with learning disabilities (LD) often experience difficulties in writing fluently and using a diversity of words. To help these students, specific and effective writing strategies must be incorporated into instruction and demonstrated to them through modeling. This study examined the effectiveness of using a story map and story map questions to improve the story writing fluency and word usage diversity of four students with LD using a multiple-probe design. Results showed that three of the four students improved their writing fluency. Regarding the diversity of word usage, no considerable changes were found in the students' writing performance. This finding supports the use of the story mapping strategy by teachers who are looking for ways to improve the writing fluency of students with LD. For students who struggle with the diversity of word usage in story writing, it is suggested this strategy be used in combination with other strategies that focus on improving word usage.

Key Words: Learning Disabilities, Story Map, Story Writing, Writing Fluency, Word Diversity

Due to the challenging nature of writing, many students with learning disabilities (LD) experience difficulty when having to complete writing assignments (Houck & Billingsley, 1989; Newcomer & Barenbaum, 1991; Thomas, Englert, & Gregg, 1987). Much of the literature suggests that students with LD are less fluent in writing than those without disabilities (Montague, Maddux, & Dereshiwsky, 1990; Nodine, Barenbaum, & Newcomer, 1985; Poplin, Gray, Larsen, Banikowski, & Mehring, 1980). Students with LD tend to have problems in vocabulary use as well. In writing, their use of vocabulary often suffers from lack of variety (Morris & Crump, 1982) and sophistication (Houck & Billingsley, 1989). Furthermore, their choice of words is rather limited, and they use fewer words that are specific and rich in meaning.

In narrative writing, students with LD may have difficulty in grasping the text structures and controlling the logical development of story events (Newcomer & Barenbaum, 1991; Nodine et al., 1985). Story writing becomes more complex when students have to incorporate story elements, such as characters, settings, goals, problems, solutions, and outcomes, into the writing (Bain, Bailet, & Moats, 1991). The stories written by students with LD are often rated as being of low quality as evi-

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denced in story length, organization, structure, linking ideas, and ordering story elements with components related temporarily and logically (MacArthur & Graham, 1987). Barenbaum, Newcomer and Nodine (1987) also noted that students with LD had difficulty generating stories. Compared with low achievers and typical achievers, they were the least fluent writers, producing the fewest number of words. Further, these students do not know how to frame their stories so that all the basic story elements can be included. For example, Laughton and Morris (1989) found that most students with LD in their study included fewer components of stories than peers without disabilities.

Various strategies have been invented to facilitate students' learning of story structures, including story mapping. A story map is a graphic technique designed specifically to facilitate story organization. This technique uses a diagram (called a story map) to depict visually the settings or the sequence of events and actions of story characters. Based on schema theory (Anderson, 1977), which emphasizes linking previous knowledge structures (schemas) with the learning of new materials for effective learning, story mapping is intended to help students develop a story schema by providing them with a bird's eye view of the basic story structure and the relationship between story elements. It enables students to visualize the basic story structure and story elements and helps them perceive the sequence of story development. Thus, by using a story map, students can realize that the settings, events, and characters of a story are interrelated. Because of the visual characteristics of story mapping, students may also find it helpful in planning their story writing.

Research finds that story mapping may be effective in helping students with LD to comprehend stories and recall story information (Gardill & Jitendra, 1999; Idol & Croll, 1987; Vallecorsa & deBettencourt, 1997). Zipprich (1995) showed that a pre-structured story web could increase students' planning time and improve writing quality. However, her students showed inconsistent gains in terms of the number of words and the number of thought units included in their writing. Vallecorsa and deBettencourt (1997) investigated a mapping procedure for teaching elements of the story form to middle-grade students with LD. The results of the study suggested that the mapping procedure positively affected the number of story elements included in students' recall of stories. However, there was limited transfer of this skill to the students' writing performance. Only when the students received direct instruction in the use of the mapping procedure for writing did they show improvement.

Story cues refer to the facilitative hints, usually in the form of a checklist, used to prompt students' attention, memory, and accuracy (Graves & Hauge, 1993). Graves and Hauge (1993) recommended that story cues be used with students who can identify story elements and can write simple stories but have difficulty creating complete and well-organized stories. Story cues can be conveniently used together with other instructional strategies, such as story maps. For example, they can be questions developed around a story map reminding students of the story components and procedures. As both story mapping and story map questions are relatively easy to manipulate, this approach has great instructional value.

Story mapping and story map questions are instructional strategies that may hold promise for many students who are struggling with narrative writing.

However, few of the studies about story mapping or story map questions have explored the effect of these strategies on writing fluency and word usage. Specifically, the following questions remain to be answered: Will instruction of these strategies positively affect students' writing by increasing their story production and fluency? Will these strategies help improve and expand the variety of word usage in students' story writing?

This study was an attempt to explore this area and these unanswered questions. In particular, the purpose of the study was to evaluate the effectiveness of the story mapping strategy and the facilitative story map questions. The research questions were (a) What are the effects of the instructional strategy of using story maps and story map questions on the fluency of story writing by students with learning disabilities? and (b) What are the effects of this strategy on the word usage by students with learning disabilities?

METHOD

Participants

Participants were four 4th- and/or 5th-grade students with LD from two suburban elementary schools in the southwest United States. Three participants (Jim, Stanley, and Kathy) were White and one (Freda) was Hispanic. Selection of participants was based on the recommendation of general educators, special educators, or other qualified persons who had worked closely with the participants and were well acquainted with their academic performances and skills in writing. The Learning Disabilities Diagnostic Inventory (LDDI) (Hammill & Bryant, 1998) was used to identify students with processing problems in written language. Profiles of the participants' scores on the LDDI scales and their performance on the Subtest of Written Expression of the WIAT are shown on Tables 1 and 2, respectively.

Jim was 10 years, 11 months old when the study started. A fifth grader, Jim was identified by his school as having LD and was included in the general education programs. Jim had problems with reading and writing. To help him in these content areas, his general education teachers referred him to the Content Mastery class of the school 1-2 hours a week to receive remedial instruction.

Stanley was an 11 years, 10 months-old fifth grader. He was particularly weak in mathematics and writing. As a result, he was pulled out of the general education program for about two hours each week to receive remedial instruction in the resource room. Stanley's ratings on the LDDI scales indicated that he had potential problems in writing and math.

Freda was 10 years and 6 months old at the onset of the study. She was also a fifth grader. Born in the United States to Spanish-speaking parents, Freda's primary language was English. Freda had disabilities in reading and writing. Her general education teacher often provided extra help to her both in class and out of class. Freda's parents were concerned about her learning disabilities and were planning to take her to see some language specialists. On Sundays Freda went to a learning center where she received remedial instruction in reading.

Kathy was 9 years, 3 months old and was enrolled in the fourth grade. She was recently transferred from another school where her LD was first identified. She had difficulties in listening, speaking, and writing, and she needed constant help

from her teacher both in class and out of class. Her teacher's evaluation of her performance using the LDDI scales confirmed her weaknesses in these areas.

Table 1
Profiles of the Participants' Scores on the LDDI Scales

Participants	Scores in Stanine					
	LI	SP	RD	WT	M	TRE
Jim	9	9	6	5	9	9
Stanley	9	9	9	5	5	9
Freda	3	4	6	3	5	7
Kathy	1	4	6	5	9	7

Note. LI = listening; SP = speaking; RD = reading; WT = writing; MT = mathematics; RE = reasoning.

Table 2
Participants' Performance on the Subtest of Written Expression of the WIAT

Participants	Elements of Writing Skills						
	I&D	OUC	VOC	SSV	G&U	C&P	Total
Jim	2	2	3	1	2	2	12
Stanley	2	2	2	1	2	1	10
Freda	2	2	2	2	3	2	13
Kathy	2	2	3	1	2	1	11

Note. I&D = ideas and development; OUC = organization, utility, and coherence; VOC = vocabulary; SSV = sentence structure and variety; G&U = grammar and usage; C&P = capitalization and punctuation.

Research Design

A multiple-probe single-case experimental design was used across the four participants. In a multiple-probe design, a variation of the basic multiple-baseline design, the researcher does not collect baseline data on a continuous basis. Instead, probe trials that are operationally identical to preintervention baseline trials are conducted intermittently on behaviors to be trained (Tawney & Gast, 1984). In the beginning, an initial probe was conducted across all participants. A minimum of three consecutive probe sessions were scheduled for the first participant, Jim. When Jim's performance level had shown stability, continuous intervention sessions started for him. Following that, a minimum of three consecutive probe sessions were applied to the second participant, Stanley, while the third and fourth participants only received intermittently scheduled probe sessions. When Stanley had exhibited stable baseline performance, intervention initiated for him on a continuous basis. Then consecutive probe sessions were conducted for the third participant, Freda. Such sessions were withheld for the fourth participant until Freda showed stable baseline performance and intervention started for her. Similarly, the fourth participant, Kathy, began to receive intervention only when her performance during the probe sessions became stable.

Independent and Dependent Variables

The independent variable was the instructional strategy of using story mapping and the facilitative story map questions. During the intervention as well as the maintenance sessions, the participants were provided with the story map and the story map questions. Two dependent variables were measured objectively to assess participants' performance in story writing. One of them was their story writing fluency. This was measured by counting the total number of T-units in a story. Another dependent variable was the diversity of word usage; that is, the range of different words used in a story. The diversity of word usage was presented in the type/token ratio. It was calculated as the number of different words used in a story, divided by the total number of words of the story. A ratio of 1.0 indicated no redundancy; a ratio of .5 meant there was frequent repetition (Polloway & Smith, 1992).

Intervention Materials

A set of training materials were used, which included (a) Picture prompts for generating stories. The pictures were selected from current newspapers, magazines, children's books, pictorials, and so forth. A picture prompt consisted of a scene with various characters or a single character or object. Before the study, the picture prompts had been presented to two other students of the participants' age level. These two students (a boy and a girl) were asked to identify the pictures that were interesting and that prompted easy story writing. Pictures that were rated poor by the two students were not used. (b) A story map designed to facilitate generation and organization of narrative content. This story map was adapted from the Outline of Story-Mapping Components developed by Idol and Croll (1987). This generic type of story map was used during the first phase of intervention. (c) A set of story map questions designed for helping participants to explore story ideas and make elaboration. The questions were incorporated into the generic story map. The story map questions combined with the generic story map were presented to the participants during the second and third phases of intervention and the maintenance phase (see Appendix).

Procedures

Baseline condition. After giving each student a pencil and a sheet of lined paper, I, the researcher, showed them a set of four pictures and asked them to choose one. Then I instructed them to plan and write a story based on the content of the picture within 30 minutes, underscoring that the content was most important and that they would not be penalized for mechanical errors. I did not provide feedback about the content and the quality of their stories. However, I did provide the correct spelling for individual words when requested. I told the students to write on every other line of the sheet of paper so that they could add content or make changes later. I also informed them that they could take dictionaries to their writing sessions if they desired, but none of them did so.

Intervention phase 1. Phase 1 involved the researcher modeling the use of the story map. After the participants' writing performances exhibited acceptable stability in the level of fluency, the intervention was applied. During the first phase, I showed the participants a set of four pictures and asked them to choose one. I then showed them the pre-structured generic story map. I also explained the components of a story and showed the participants how these components were related. Together,

we then worked to generate ideas, brainstorming possible characters, events, problems, solutions, and the outcome of the story. I modeled for the participants by writing the ideas down in the story map and subsequently allowed them 20 minutes to plan and write a story with the help of the generated ideas and the story map. I reminded them that they would not be penalized for mechanical errors.

Intervention phase 2. After five sessions of story map modeling, the second phase of intervention began to introduce the story map questions. In addition to the story map, the participants received the story map questions in both written and spoken forms. The written questions were printed in the story map boxes. The questions in spoken forms were provided verbally by me. The questions served to remind the participants of the story elements and possible ideas associated with them. During this phase, I required the students to generate ideas for their stories while I facilitated the process with questions. Guided by the questions, the participants spoke aloud about their ideas for story planning. Then I wrote down the ideas in the story map. The participants referred to these ideas when they wrote their stories.

Intervention phase 3. This phase involved researcher guidance and started after five consecutive sessions of the second phase of intervention. During this new phase, I stopped modeling and provided only verbal guidance as necessary. Again, I showed students a set of four pictures and told them to choose one. I gave them a copy of the story map combined with the facilitating story map questions and asked them to generate ideas for a story and fill in the map. I answered their questions concerning the story map and story ideas and reminded them of the important story elements that they had missed. I used story map questions to help the participants develop stories. However, the participants were responsible for generating their own ideas for the stories. Then I allowed them 20 minutes to write a story with the help of the generated ideas and the story map.

Maintenance phase. After a participant showed a 50% increase in writing fluency over the average of the baseline phase for seven consecutive sessions during intervention phase 3, intervention was stopped. This margin of improvement was set based on findings of other studies (Graves, Semmel, & Gerber, 1994; Montague & Leavell, 1994; Nodine et al., 1985). However, if the participants failed to demonstrate this 50% increase for seven consecutive sessions during intervention phase 3, the intervention was still terminated and the maintenance phase began.

During the maintenance phase, I showed the participants a set of four picture prompts and let them choose one of the prompts. Then I gave the participants a story map with the story map questions printed in it. Unlike during the intervention phases, I did not work together with the participants to generate story ideas, nor did I provide verbal questions. During this phase, I conducted checks once a week instead of every day.

Procedural Reliability

To ensure that the study followed a consistent and systematic procedure, approximately 20% of all sessions were tape-recorded from beginning to end. Two evaluators subsequently listened to the tapes independently, checking the procedures of the sessions and evaluating the steps that I had taken in administering the sessions. Their evaluation records were then brought together and compared.

Agreement of evaluations was assessed on a point-by-point basis by following the formula recommended by Kazdin (1982, p. 54):

$$\text{Agreement} = \frac{A}{A + D} \times 100$$

      where A = agreement for the trial
            D = disagreement for the trial

The results showed an overall evaluator agreement of 93.5%, which indicated a high level of procedural reliability.

Inter-Rater Agreement

In order to minimize biases in scoring the stories and to increase the accuracy of ratings, the study used an independent rater to rate some of the stories as a reliability check. The independent rater was a trained professional in education with past experience in writing instruction. I rated all the stories written by the participants. The independent rater conducted reliability checks approximately once every three sessions, about 30% of all the stories.

Agreement between the raters was assessed by using the method of frequency ratio (Kazdin, 1982). This method computes agreement when comparisons are made between the totals of two raters who independently record behaviors. In the present study, the two totals of, for example, T-units observed by the two raters in a written story, were put into the following formula to determine the rater agreement:
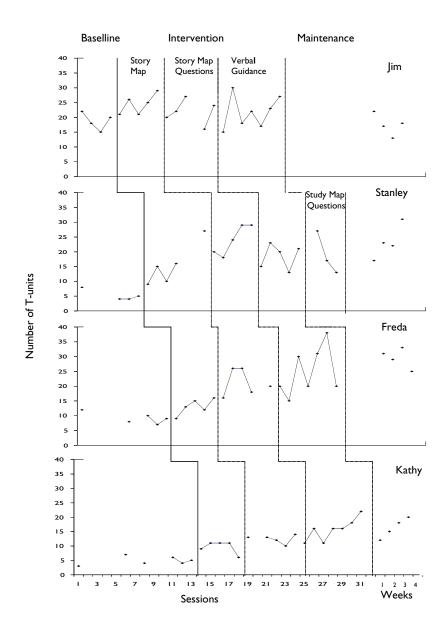
$$\text{Rater Agreement} = \frac{\text{Smaller total}}{\text{Larger total}} \times 100.$$

In a similar manner, the agreement of word diversity was calculated by dividing the smaller percentage by the larger percentage and multiplying by 100. The rater agreement ratio obtained from this formula was the estimated agreement on one particular occasion in which reliability was assessed. After all inter-rater agreement checks had been collected, the individual agreement percentages were tabulated. The acceptable agreement level was set at 90% prior to the start of the study. Assessment results showed that the inter-rater reliability was high for most story evaluations. Except on one of Kathy's stories, the agreement between the two raters fell below 90% on number of T-units; all other rating agreements fell within the range of 91% to 100%, which satisfied the pre-set criteria.

RESULTS

Writing Fluency

To measure participants' fluency in story writing, the number of T-units in each story was counted. Figure 1 shows the four students' writing fluency judged by counting the number of T-units in each story. Missing data resulted from sessions being interrupted by unpredictable or uncontrollable events, such as when participants were sick or were required to participate in school-organized activities.

Figure 1. Number of T-units in participants' stories.

Jim's behavior showed variability throughout the three experimental phases. Jim demonstrated a higher level of fluency than the other three during the baseline phase, producing an average of 18.8 T-units per story. During intervention phase 1, in which I modeled the story map for the participants, Jim demonstrated an improvement over the baseline level by increasing the mean number of T-units per story to 24.4. Then in the second phase, facilitation with story map questions, his fluency decreased. Yet, his average number of T-units (21.8) was still higher than during the baseline condition. During the third phase, Jim's stories varied from a high of 30 to a low of 15 T-units. Because of this extreme variability, intervention was called off after seven consecutive sessions. In this phase of intervention, Jim's stories averaged 21.7 T-units per story. During maintenance, Jim failed to maintain the limited improvement that he demonstrated during the intervention phases. On average, his stories during maintenance contained only 17.5 T-units per story.

Stanley generally demonstrated an upward trend during the intervention phases compared with the baseline condition. During the baseline phase, Stanley wrote stories with very limited fluency; except for the first probe, the three baseline stories contained only four or five T-units each. When story mapping was introduced in the first phase of intervention, Stanley demonstrated a noticeable increase in the number of T-units, which doubled or even tripled compared with those written during the baseline condition. The last story in this phase of intervention contained 27 T-units, much higher than the baseline stories. During the second phase of intervention, more progress was observed. Four out of the five stories contained 20 or more T-units. These stories averaged 24 T-units each. During the third phase of intervention, in which guidance was provided only when requested, Stanley's fluency rate exhibited a declining trend as compared with phase 2, the average number of T-units dropping to 18.4. In view of this situation, I stopped this intervention condition and renewed the condition of the second phase. When returned to the previous condition, Stanley's story output increased again, but only for one session. The next two stories showed decrease once more in the number of T-units. Overall, all his intervention stories surpassed his baseline stories in terms of the number of T-units. During maintenance, Stanley's stories showed an increasing trend. The average number of T-units in each story in this period was 23.3.

Freda demonstrated an increase in her performance throughout the intervention phases and the maintenance phase. In the first phase of intervention, Freda's stories exhibited continued gains in the number of T-units. Her stories averaged 13 T-units per story during this phase as compared to the average of 9.2 T-units during baseline. As the sessions moved into the second phase of intervention, Freda showed continued gains for three sessions, with a decrease observed in the fourth. Her stories averaged 21.2 T-units during the second phase. Phase 3 showed a variable pattern. However, the general trend was still upward, with an average of 24.9 T-units per story. During the maintenance condition, Freda maintained her progress by writing stories that contained an average of 29.5 T-units per story.

Kathy exhibited a general trend of progress during the intervention. Kathy started by producing very short stories averaging 4.83 T-units during the baseline phase. When the story map was introduced to her during intervention phase 1, she demonstrated an increase in fluency. Except for the last story, which showed a

decline, all the other stories surpassed the baseline stories. During phase 1, Kathy produced an average of 9.6 T-units per story. When story map questions were introduced during phase 2, she continued her gains in story output, producing stories with an average of 12.4 T-units per story. Her gains during the third phase of intervention were even more noticeable, her stories averaging 15.7 T-units. Finally, during maintenance, Kathy's first two stories contained fewer T-units than much of the previous phase. However, this phase showed a consistent upward trend, averaging 16.3 T-units per story. It should be pointed out that during intervention phase 3 and maintenance, Kathy expressed a dislike for filling out the story map on her own. Therefore, I let her vocalize her story plan instead of writing a story map. This yielded a higher level of performance during the latter part of the maintenance phase.
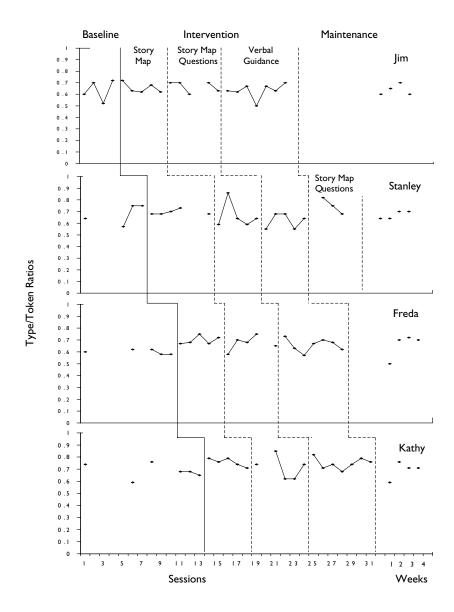
Word Diversity

In this study, word diversity was represented by the type/token ratio, measured by dividing the number of different words used in a story (type) by the total number of words used in that same story (token). In order to measure accurately the changes in word diversity in the writings of a participant over a period of time, the length of the passage (token) being analyzed had to be held constant. Because the four participants varied greatly in their story output, the length of the passage selected for analyzing the stories was not the same.

The length of the passage selected for Jim and Freda was 60 words. For Stanley, whose shortest story contained 44 words, the length of passage selected was 44 words. In the same manner, the selected passage length for Kathy was 34 words. All passages selected for calculating the type/token ratio were counted from the first word of the story up to the 60th (or 44th, or 34th) words. The results of word diversity in story writing for each of the four participants are presented in Figure 2.

As illustrated in Figure 2, overall the four participants' use of words did not show any considerable change in diversity over the different phases. Although the diversity ratio sometimes varied greatly between individual writing sessions, the general trend remained stable. This indicates that the interventions had little effect on the word diversity of the participants' story writings.

Jim's stories exhibited minimal variability in word diversity ratio throughout the study. The highest ratio was .72, which he demonstrated in the fourth session during baseline, and in the first session during intervention phase 1. However, the overall word diversity ratios during the baseline, intervention, and maintenance phases did not vary considerably. The average ratio for each of the experimental conditions was as follows: baseline, .64, intervention phase 1, .65, intervention phase 2, .67, intervention phase 3, .63, and maintenance, .64 (see Figure 3).
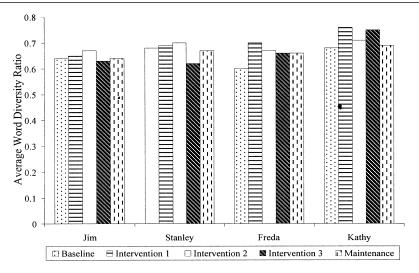
As mentioned, Stanley's passage length selected for analysis was 44 words. His stories showed more variability in word diversity ratio. The highest ratio was .86 (the second session during intervention phase 2). The lowest was .55, which occurred twice (the first and the fourth sessions during intervention phase 3). The low diversity ratio implied that in these two sessions, there were frequent repetitions of word use in the stories. On average, Stanley used noticeably fewer words during intervention phase 3 than during other phases. The average word diversity ratios of other phases did not exhibit big variations.

Figure 2. Word diversity ratios of participants' stories.

Freda's profile differed from Jim's and Stanley's in that her stories showed improvement over time. Freda began her baseline stories with diversity ratio: either below .60 or in the low .60s (average = .60). When intervention started, her stories increased in the number of different words used. Although there were fluctuations during intervention and maintenance, the overall ratios were higher than for baseline. The averages of the three intervention phases and the maintenance phase were, respectively, .70, .67, .68, and .66. The increase during intervention phase 1 was particularly impressive.

The passage length selected for Kathy was 34 words, corresponding to the shortest of her stories. As illustrated in Figure 3, the word diversity ratios in Kathy's stories showed an irregular pattern with steep rises and falls. The highest ratio was .85, whereas the lowest was .59. However, in terms of the averages, Kathy's stories showed some improvement. The word diversity ratio averages of the intervention and maintenance phases were .76, .71, .75, and .69, respectively, compared to .68 during baseline. The increases during intervention phases 1 and 3 were especially noticeable.

Figure 3. Average word diversity ratios of participants' stories across experimental phases

Discussion

Story Map and Story Writing Fluency

Story mapping was found to be effective for improving the story writing fluency of three of the four participants in the current study. The stories written by Stanley, Freda, and Kathy showed improvements after the intervention of the story mapping strategy was introduced. Their stories during intervention and maintenance phases were noticeably longer than those written during the baseline phase. However, the effect of this intervention was not apparent on Jim.

Overall, Jim's profile did not exhibit the expected improvement. When I first introduced the story map to him during intervention phase 1, he seemed to have increased in story writing fluency. However, after I stopped modeling, he was unable to maintain his improvement. During the second phase of intervention, the story map questions did not prove to be effective in increasing his fluency. His performance did not show improvement in later stages either. The number of T-units in his stories remained at or near the baseline level. There may be several reasons for his lack of improvement. First, Jim seemed to have lost some motivation later in the study. Sometimes he would rush to writing the end of a story without considering if the story was fully developed or not. Second, the restricted time allowed for each writing session (20 minutes) could have affected Jim's writing fluency. During the baseline, Jim concentrated on writing better than the other participants and spent most of the time writing his stories. During the later phases, the time allowed for writing remained unchanged. This made it difficult for Jim to drastically increase his story output. On several occasions, Jim had more ideas he wanted to write about in his stories, but I stopped him because the time was up. So, even if the story map helped Jim in planning and developing his stories, it was unlikely that he would have made dramatic changes in the quantity of story writing.

The improvement in writing fluency of the three other students was remarkable. They all started with baseline stories that were short and poorly developed. However, after the intervention was introduced, their stories were much longer and richer in content. The baseline stories of Stanley and Kathy generally contained four to eight T-units, but their stories written during intervention and maintenance mostly doubled or even tripled compared with the baseline stories. Of the three intervention conditions, the intervention of story maps together with story map questions seemed to work best with Stanley. However, Freda and Kathy seemed to benefit more from the story mapping strategy plus researcher guidance. All three participants showed more improvement during the second and third intervention phases than during the first when I only modeled the use of the story map. The diversity of the participants' performance suggested that they had different learning styles and preferences. This likely would be true for other students with LD as well. That is, some would benefit more from one intervention condition whereas others would benefit more from another. Generally speaking, in this study the story map did not work as effectively with researcher modeling as it did with facilitative questions or with researcher guidance. Perhaps this was because there was too much researcher intervention in modeling, which might have interfered with the development of the participants' own ideas.

Story mapping may have helped some of the students to think about the story organization, content, development, and outcome. A story map is like a visual aid that can help students in planning stories. Many students with LD do not know how to plan a story. As a result, they experience difficulty in developing stories fully. Often they stop writing abruptly without knowing how to proceed or what to write next. However, with the aid of a story map, students are reminded of what a typical story should consist of and how they should approach the task of story writing. For example, a student may forget to write about the problem that the main character faces in achieving a goal. But with a story map, the student is prompted and thus is

more likely to add this part to the story. With good planning, the student may even elaborate and make the story richer, more interesting, and more comprehensible. So it makes good sense that students with LD will likely improve their writing fluency and increase their story output by using a story mapping strategy. Because of this potential benefit, teachers of students with LD may consider this strategy for those students with problems in writing fluency.

Story Map and Word Diversity

The findings showed that overall the story mapping strategy did not improve participants' word usage diversity, although some noticeable increases in the diversity ratio were observed in Freda's and Kathy's stories. For both of them, the highest ratio seemed to have occurred in the stories written during intervention phase 1. This may suggest that my involvement in brainstorming for possible story ideas and elements affected their increase of word use in their stories. In discussing the story characters, the setting, the goal, and the events with the participants, I might have used words that could have influenced their choice of words. On average, the stories written by Freda and Kathy during the other two intervention phases were also higher in the type/token ratio than those written during baseline. This may be an indication that for some students with LD, story mapping can increase word diversity when used appropriately. Perhaps this is because a story map can lead students to make more word associations when developing stories. To prove these speculations, more research is necessary.

On the other hand, the type/token ratios for Jim's and Stanley's stories remained relatively unchanged throughout all experimental conditions. This finding may suggest some inter-participant variations in terms of learning style and need. So while the story mapping strategy may help some students write stories with more diverse vocabulary, this therapeutic effect probably will not be evident in all students with LD. Story mapping focuses on the plan, organization, and story components and the relationships among these components, rather than the variety of vocabulary. Therefore, even if students become more fluent in story production, there is no guarantee word diversity will increase.

Limitations of the Study

Although the benefits of the intervention were apparent for most participants in the study, a number of limitations of this study should be mentioned. First, each participant was pulled out of his or her general education classroom for 30 minutes every day. This intensive working schedule was not ideal. From my observation, the participants showed great enthusiasm during the beginning writing sessions. As the days passed, some began to show signs of fatigue, and sometimes even loss of interest. Future studies should consider reducing the number of sessions if possible. Second, the four picture prompts for each session were selected specifically for this research. Although they had previously been viewed by two students who were similar to the participants in age, this is no guarantee that they would be interesting to study participants, which in turn could affect writing fluency. Third, each session was limited to 30 minutes. This time limit was arbitrary rather than based on each participant's actual attention span. Since students with LD tend to have a short attention span and cannot focus on a task for a long time, a 30-minute writing session might not be an appropriate length for a participant to remain on task. Fourth,

because of the study design, a small sample size was used. This has inevitably limited the power of the study to generalize the results to other individuals with different characteristics and in different settings. Future replications are needed to help determine the effectiveness of this intervention for other individuals and eventually to establish generalizability.

Conclusions

This study examined the effects of the story map and story map questions on the story writing of students with LD. Although studies abound that explore the writing development of students with LD and the use of instructional strategies to improve students' writing performance, relatively few empirical studies have investigated the direct instructional effect of using story mapping and facilitative cues on students' writing fluency and word diversity. Further, the findings of these studies are far from conclusive.

The findings of the present study provide evidence that the use of a story map and story map questions was effective in improving the narrative writing fluency of some students with learning disabilities. Three of the four participants dramatically increased the number of T-units in their stories. The fourth participant did not demonstrate improvement in writing fluency. This may be because fluency was not as much a problem to him at the beginning of the study as it was to the other participants. Regarding the second research question about the word diversity in story writing, the findings of this study did not provide evidence that the story mapping strategy positively affected students' performance. While two participants increased the type/token ratio to some extent, the ratios of the other two participants remained relatively unchanged.

In light of these findings, it may be concluded that story mapping and story map questions is a useful tool for improving story writing fluency of students with LD. The strategy may also be used effectively for helping students write stories that are more complete and contain more story elements. Writing teachers are encouraged to use the strategy to teach story structure and story writing. However, for students who are weak in word usage, story mapping and story map questions may not be useful. To help students increase word diversity in story writing, other effective strategies that focus on word usage should be sought and combined with story maps and story map questions.
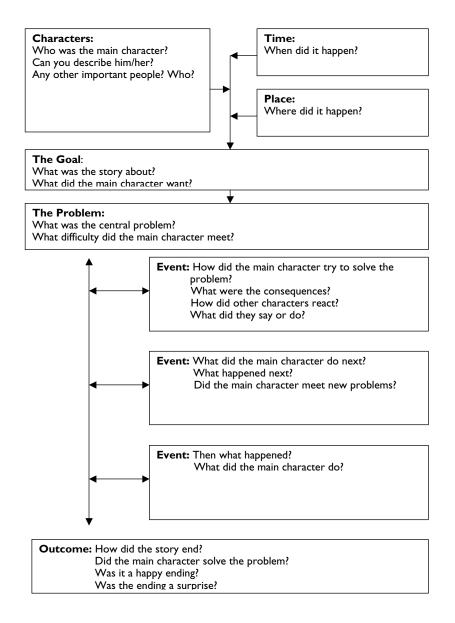
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Appendix

Characters:
Who was the main character?
Can you describe him/her?
Any other important people? Who?

Time:
When did it happen?

Place:
Where did it happen?

The Goal:
What was the story about?
What did the main character want?

The Problem:
What was the central problem?
What difficulty did the main character meet?

Event: How did the main character try to solve the
problem?
What were the consequences?
How did other characters react?
What did they say or do?

Event: What did the main character do next?
What happened next?
Did the main character meet new problems?

Event: Then what happened?
What did the main character do?

Outcome: How did the story end?
Did the main character solve the problem?
Was it a happy ending?
Was the ending a surprise?