Teaching the Function of Writing to Middle School Students With Academic Delays

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Abstract

Using multiple baseline designs, we studied the effects of having seven 9th graders edit their papers until a naïve reader accomplished a drawing assignment during writer immersion (communication in writing only). During Experiment I, students received no feedback in the first phase, teacher editing feedback in phase 2, and writer immersion plus viewing the effects of their writing on a naïve reader in phase 3. In Experiment II, students received the baseline followed by writer immersion and viewing effects on a reader. The dependent variables in both experiments were the structural components of the writing and accurately drawn components by a naïve reader. The writer immersion and self-editing package increased accuracy in structure and function in both experiments.
Keywords: Writer Immersion, Establishing Operations, Function, Teacher Editing, Self-Editing

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While most state and national educational standards emphasize the importance of writing, the standards refer often only to the structural components of writing and ignore the functional effects. While structure is a necessary component of effective writing, it is not sufficient alone for functionally effective writing.

From a verbal behavior analysis perspective, writing is a social behavior. According to Skinner (1953), social behavior is behavior between two or more people that makes contact with a common environment. "Verbal behavior always involves social reinforcement and derives its characteristic properties from this fact" (Skinner, 1953, p. 299). Verbal behavior is characterized by the effect one person has on another person including effects on the listener and speaker, as well as the effects of the writer on the reader (Greer & Ross, 2004).

Establishing operations, key components of all verbal behavior, are "changes in the environment with alter the effectiveness of any object or event as reinforcement and simultaneously alters the frequency of the behavior followed by the reinforcement" (Michael, 1982, 1984, 1993). Several experiments have identified establishing operation tactics that have been effective in producing the motivational contexts necessary to teach listener and speaker verbal capabilities (Greer & Keohane, 2005, Greer & Ross, 2004).

Listener immersion is an establishing operation that immerses the student in listener instruction to induce the immersion of basic listener literacy (Greer, Chavez-Brown, Nirgudkar, Stolfi, & Rivera-Valdes, 2005; Greer & Ross, in press). During listener immersion, students are taught to respond to vowel-consonant combinations to teach auditory control of responding (Greer & Ross, 2004). Greer, Chavez-Brown et al. implemented listener immersion with eight three to four year olds diagnosed with developmental disabilities who did not meet instructional objectives. In the procedure, all instruction throughout the day was devoted to teaching children to respond solely to vowel consonant combinations until they had mastered a sequence of successively more difficult responses. That is, only responding to vowel consonant combinations was reinforced, thus the immersion created an establishing operation. The procedure resulted in

the immersion of listener literacy that, in turn, led to decrease in numbers of learn units to criterion from four to ten times faster learning for all students across all curricular areas.

Other studies have identified a speaker immersion procedure that arranges conditions that require students to use different forms of speaker behaviors to make transitions in their environment (Greer, 1994, Ross, 1995). Ross, Nuzzolo, Stolfi, Naterelli and Greer (2006; See this issue) tested the effects of speaker immersion on four students diagnosed with developmental disabilities and found significant increases in the numbers of independent mands emitted by all of the students during the implementation of speaker immersion and during generalization probes.

A third establishing operation tactic is writer immersion. Writer immersion is a procedure that includes setting aside a period of time in which all communication is done through written responses (Greer, 2002; Greer & Ross, 2001; Madho, 1997). This includes responding in written form to writing assignments, as well as questions and mands for access to reinforcers. This procedure is designed to teach the relevant establishing operations for writing that is essential to the acquisition of a functional verbal response. In order for writing to be socially effective, it must have particular effects on the reader—effects sought by the writer.

Madho (1997) tested the effects of the responses of a reader upon the effectiveness of a written composition. In a delayed multiple baseline across subjects design, the students were given writing assignments requiring them to write a description without identifying the item or to write directions. The students were required to rewrite the composition until the reader identified the object or perform the desired goal. Before they received the writer immersion procedure they could not provide accurate descriptions. After the writer immersion intervention the data show that there was a significant improvement in the writer's descriptions (Madho, 1997).

The editing of verbal behavior, according to Skinner (1957) is controlled by the potential for punishment by a reader when the writing is ineffective. Therefore, writers need to "affect the speaker before it reaches a listener [or reader]" (Skinner, 1957, p. 369). Students can self-edit their own writing after the acquisition of the self-editing repertoire. The writer must react as a reader to his own behavior (Skinner, 1957). In order to do so, experiences that result in the writer learning to affect the behavior of a reader need to occur as the controlling consequence for the writer before the editing repertoire can be developed.

During the implementation of writer immersion, the student is required to rewrite the written response until it produces the desired effect (Greer, 2002, Madho, 1997). Rewriting, or doing drafts until the writing affects the behavior of a reader, teaches a student to edit their own writing, and thus teaches the student self-editing (Greer & Ross, in press). The student writes such that they can affect the behavior of a reader - the function of writing.

Jadlowski (2000) tested the effects of self-editing and revising on writing functions. In that study, with three 7th graders diagnosed with a learning disability and a 3rd grader diagnosed with a speech and language impairment, Jadlowski (2000) found that having a peer editor read a student's written responses resulted in fewer necessary corrections and students completed compositions in fewer learn units (recycles) when a peer served as the reader than when the teacher served as the reader. In a second experiment study with students, ages 7 and 11 who were diagnosed with mental retardation and speech and language disorder respectfully, she found that it was serving as an editor for the other writers was the source of improvements in writer functions rather than who did the editing for the writers.

Building on the prior work, the present studies sought to test the effects of writer immersion and viewing the effects of the students writing on responses emitted by readers who were naïve to the conditions and objective of the experiments. Thus, we tested the effects of our procedures on both the function and structural components of the students' writing.

Experiment 1

Method

Participants. Three students, attending a 9th grade class in which all instruction applied behavior analysis to all curriculum and pedagogical procedures, participated in this study. Participant A was a 15-year old male diagnosed with a behavioral disorder. He functioned academically at approximately a 3rd grade level. Participant B was a 16-year old male diagnosed with a behavioral disorder. He functioned academically at approximately a 2nd grade level. Participant C was a 15-year old female diagnosed with a behavioral disorder. She functioned academically at approximately a 6th grade level. All of the participants followed directions in class, but had difficulty working independently. The students were from economically disenfranchised communities and were similar, but older, to the children in the low socio-economic group who participated in the Hart and Risley (1995) longitudinal study. The participants were chosen because of many structural errors in their writing, as well as their inability to write functionally (Table 1).

Table 1: Participants in Experiment 1

Student	Student A: 9th grade student	Student B: 9th grade student	Student C: 9th grade student
Level of Verbal Behavior	Reader/writer	Reader/writer	Reader/writer/ emergent self-editor
Diagnosis	Behavior Disorder Learning Disability	Behavior Disorder	Behavior Disorder
Functioning Grade Level	3rd Grade	2nd Grade	6th Grade
Repertoires	High percentage of structural errors in writing Functional writing was not in student's repertoire	High percentage of structural errors in writing Functional writing was not in student's repertoire	High percentage of structural errors in writing Functional writing was not in student's repertoire

Setting. All writing occurred in the 9th grade classroom or in the library in the public school. Each student was seated at a desk and given a timer, a pen, a blank sheet of paper, and the written instructions on a separate piece of paper. The teacher/experimenter was in the room at all times during each session. The classroom had 8 students: 1 teacher: 2 teaching assistants. All of the students in the class were diagnosed with behavioral disorders. Instruction in the school

was delivered through learn units by the teacher and teaching assistants in groups and 1:1 tutored instructional settings with a teacher and by peer tutoring (Albers & Greer, 1991, Greer & McDonough, 1999).

Definition of Behaviors: Dependent Variables. The dependent variables in this study were the structural components and functional effects of the students 'writing. The function of the students' writing was measured by the effects the writing had on a reader who was naive to the objectives of the study. Each student was given pictures to describe in writing. All of the pictures were counterbalanced across participants and included the same numbers of components. Ten components were determined for each picture prior to the onset of the study. Each student was given pictures that included colored shapes, lines, and a word. Each of these components of pictures was located in different areas of the page. Figure 1 shows an example of a picture and Figure 2 is the instructional page given to the students. Students were to include detailed descriptions of (1) the shape, (2) the color of the shape, (3) the position of the shape on the page (4) the word, (5) the color of the word, (6) whether the word was written in uppercase letters or lowercase letters, (7) the position of the word, (8) the line, (9) the color of the line, and (10) the position of the line on the page. Table 2 details the components of the drawings. At the end of each session throughout each phase of the study, the student's writing was given to at least one independent reader who was naïve to the purpose of the study. The naive readers, who were blind as to the conditions and objectives of the study, were a teaching assistant in the classroom and another teacher in the school. The naive reader did not know who the student was or the purpose of the study. The naive reader drew the pictures according to the students' written description. The numbers of components the independent reader drew correctly was measured as one of the dependent variables. A description was determined functional if a naïve reader drew the components of the picture correctly based on the student's description.

Figure 1

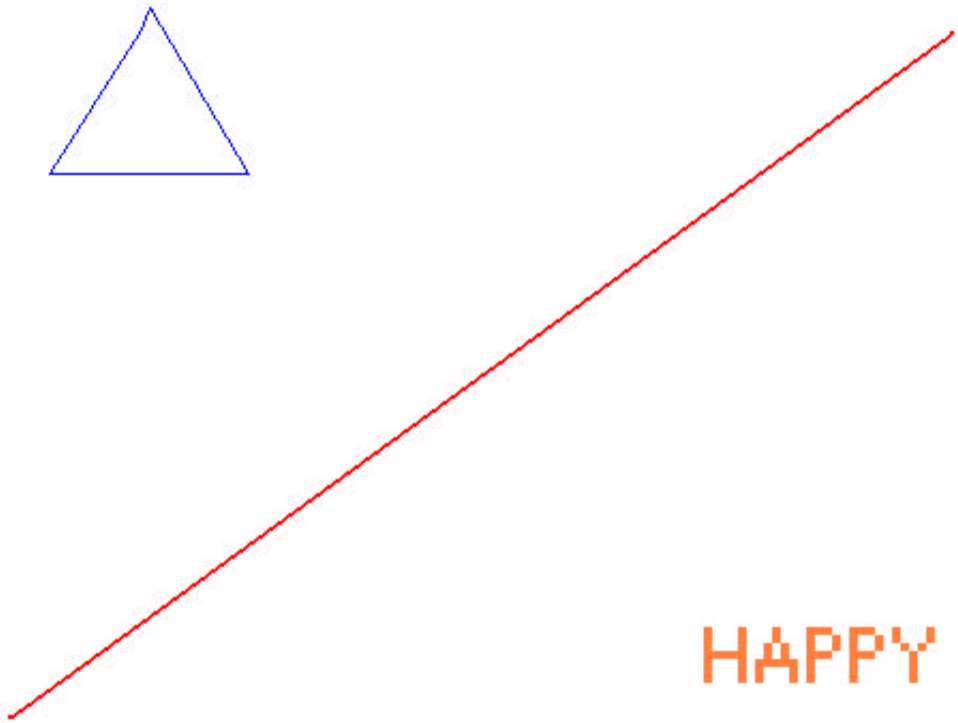

Figure 1. An example of a picture that the students used to provide written instructions to the naïve reader.

Figure 2

Name: _____
Date: _____

Directions: Describe the picture so that someone who has never seen it before will be able to draw it.

Figure 2. The written instructions given to the students for the data collection of the dependent variable.

Table 2: Functional Components of the Drawing Shown in Figure 1

Number	Component	Description in Figure 1
1	Shape	Triangle
2	Color of the shape	Blue
3	Position of the shape on the page	Top left hand corner of the page
4	Word	Happy
5	Color of the word	Orange
6	Lettering of the word	All uppercase letters
7	Position of the word on the page	Lower right hand corner of the page
8	Line	Diagonal line
9	Color of the line	Red
10	Position of the line on the page	Diagonal from the top right hand corner to the bottom left hand corner of the page

In addition to function, data were also collected on the structural components of the students writing. Structural measures included the numbers of accurate structural components throughout the essay (i.e. percentage of correct responses to grammar and punctuation of the total grammatical and structural components possible in the paper), the numbers of novel sentence frames, the numbers of adjectives and adverbs used, and the numbers of words and sentences written. These were converted to the percentage of accurate structural components out of the total possibilities and were calculated by dividing the numbers of correct responses to spelling, punctuation, capitalization, word choice, and sentence structure divided by the total numbers of opportunities to respond within each essay for each of these categories and multiplied by 100%.

Independent Variable: Teacher Editing. The independent variables in this study were (a) reader/writer learn units and (b) writer immersion. The teacher instructed the students, in writing, to describe a picture so that a reader could draw it. The written directions and picture served as the antecedent for the student and the structural and functional outcomes of the students' written responses were the dependent variables.

After the baseline phase, the teacher provided learn units for the student's written responses. The learn units consisted of providing the student with written praise for correct responses to the structure and function of writing, and corrections for incorrect responses. For the corrections the students observed the written corrections from the teacher and the students then rewrote the section as corrected. The students' corrected response were not reinforced consistent with learn unit protocol. Criterion was set at 100% correct responses for structure, including capitalization, punctuation, spelling, and sentence form after editing. That is, papers were redone until the 100% criterion was achieved.

Independent Variable: Writer Immersion and Self-Editing. Writer immersion was implemented in the third phase of this study. Writer immersion is an establishing operation tactic in which all communication is done in written form (Greer, 2002). During writer immersion, a period of time in each school day was arranged in which all communication required written responses. The time period for each student was determined by identifying the mean number of minutes each student took to complete writing assignments during the baseline phase. Questions, comments, requests for back-up reinforcers and breaks were done in writing. The students received written instructions instructing them that they were to describe pictures such that a reader could draw the pictures. After the student described the picture, the teacher gave the writing to a naïve reader (in another setting, and at a different time) who drew the components of the picture as described by the student, and provided written learn units for structural components. The teacher returned the students' written essay, the original picture with the structural corrections and the drawing done by the reader. The students then edited their paper for the functional and structural components of writing based on the reader's responses. In order to meet the criterion, the student had to affect the reader such that the reader drew all of the components correctly (100%) and there were no structural errors.

Design and Procedure. We used a multiple baseline across subjects design (Baer, Wolf, & Risley, 1968). All sessions were conducted individually with three phases. The three phases were: a non-instructional baseline phase in which the students did not receive feedback on structure or function, the first experimental phase that implemented teacher editing, and the second experimental phase that implemented writer immersion and self-editing. Table 3 outlines the steps followed during the procedure for Experiment 1.

Table 3: Sequence of Steps in Experiment 1

Pre-instructional Baseline	Step 1	The experimenter gave students a picture with all of the components and a written antecedent to write a paragraph describing the picture during a typical instructional session.
	Step 2	An adult reader, who was naïve to the purposes of the experiment and the students involved, read the students' written instructions. The reader drew a picture based only on the student's written responses and data were collected and measured. In this phase, the students' did not see the effects of their writing on the reader's drawings. No feedback in structure or function was given to the reader.
Teacher Editing	Step 3	The experimenter gave the students a picture and written antecedent as in the Baseline phase during typical instruction.
Reader/Writer Learn Units	Step 4	The reader read the students' written responses and the reader drew a picture based on the students' written essay. The results were scored separately by the experimenter and independent scorers (i.e., a

		photocopy of the students' writing was done prior to the teacher and reader feedback).
	Step 5	The experimenter provided learn units for the structural components of the writing (grammar, punctuation, spelling, word choice, sentence format) in written form.
	Step 6	The experimenter/teacher reviewed the writing with the student and provided verbal praise for correct responses to each structural and functional component of the writing. The teacher and the student discussed the function and the teacher provided learn units in vocal form. The paper was returned to the student with the written structural component corrections and the directions to recycle, or rewrite, the essay with the necessary corrections for each structural and functional component.
	Step 7	The experimenter repeated Steps 3-6 until the student met criterion specified at 100% accurate structural components for each essay after editing.
Writer Immersion And Self-Editing	Step 8	Writer immersion was implemented for a specified period of time each day. The experimenter gave the students paper and pen to write down any questions they had for the experimenter, including mands for access to backup reinforcers, a break, or the bathroom, or questions about what to do. The students also communicated with each other in written form during writer immersion sessions.
	Step 9	During the writer immersion period, the experimenter also gave the students a picture and written directions to describe the picture as in the earlier phases.
	Step 10	The students wrote an essay with the establishing operation in place.
	Step 11	The naïve reader read the students' written instructions. The reader drew a picture based only on the description provided in the student's essay. Accurate and inaccurate components of the drawing were counted.
	Step 12	The experimenter provided learn units in written form for the structural components of the essay only (grammar, punctuation, sentence form, and spelling).
	Step 13	With the establishing operation still in place (writer immersion), the teacher returned the students written essay, the original picture, and the picture drawn by the naive reader. The teacher and the students communicated in writing to discuss whether the picture drawn by the reader matched the original drawing. If the pictures matched, the teacher reinforced the student with written praise. If the pictures did not match, the student self-edited his/her writing to provide the reader with the necessary information to draw the components accurately.
	Step 14	The students rewrote the instructions until they believed that the reader could draw the picture accurately.
	Step 15	The experimenter repeated Steps 8 to 14 until the student met criterion, specified as 100% accurate structural components and 100% of the components drawn accurately by the naïve reader after editing.

Each of the above steps is described in detail in the following sections.

Pre-instructional Baseline. The teacher read aloud the directions to the students at the start of each session. These included: "Write a paragraph to describe the picture so that someone who has never seen the picture will be able to draw it." The teacher gave the students a picture, a black pen, and a lined piece of paper with the directions on the top. Each picture included one word, one shape, and one line drawn with different colored markers on a plain white 8 1/2 inch by 11 inch piece of paper. Figure 1 shows and example of a drawing and Figure 2 shows the written directions sheet used to collect data. The pictures were counterbalanced across students and phases throughout the study.

Teacher Editing. During the first intervention phase, the teacher provided learn units. After each session of writing, the students submitted their writing to the teacher. The teacher delivered the picture to a reader who was naïve to the purpose of the assignment and the identity of the student. The naive reader drew the picture described. The teacher edited the student's written responses for spelling, punctuation, and capitalization. The teacher reinforced a correct response with a check mark and circled each incorrect response. The teacher vocally discussed the effects the writing had on the reader with the student. The student did not have access to the reader's picture. The teacher vocally reinforced the student for each component described and corrected the student for the components of the picture that were not described. The teacher returned the students' written assignment, the picture, and directions to rewrite, or recycle, their assignment. The student was required to make all corrections to the structural components of their writing and include the necessary functional components missing. The student rewrote the entire essay and resubmitted it to the teacher again to re-edit until the students met criterion specified as 100% accurate structural components. The student was reinforced with points that they could exchange for back-up reinforcers including candy and preferred activities at the end of the writing session. Following the first experimental phase involving teacher presented learn units without the student viewing the effects of their writing on the drawing of the naïve reader, we implemented writer immersion plus the opportunity to view the effects of their writing on the drawing of the naïve reader.

Writer Immersion and Viewing the Effects of Writing on the Reader's Drawn Responses. During the writer immersion phase, the teacher gave vocal directions at the beginning of each session. The directions stated that for the set period of time, all communication, including questions about the assignment and mands to go to the bathroom, access backup reinforcers, or for a break, was to be done in written form. The teacher gave the student a pen, the picture to describe and written directions to describe the picture. The teacher responded to the student's written essay in written form only. The teacher gave the essay to a naive reader who drew the picture described by the student. The teacher edited the writing and made corrections on the structure (defined as sentence form, punctuation. capitalization, and spelling). The student and teacher interaction was measured in learn units in the same manner that was done in the reader/writer learn unit phase. The teacher returned the edited essay to the student, as well as the picture drawn by the naive reader. The student rewrote, or recycled, the essay. The student was required to make the necessary corrections in structure, and edit their own writing for the effects

on the reader by including or describing each of the components of the original picture that were missing or incorrect in the reader's picture. The student self-edited the functional effects of their writing. The student returned it to the teacher again to re-edit if there were any corrections until the structure and function were accurate. The student was reinforced with points for following directions and completing their writing assignment that they could exchange for back-up reinforcers anytime throughout the school day.

Data Collection. At the end of each writing session, the student's product was given to a naive reader who did not have access to the picture described. The reader drew the picture based only on the student's description. The numbers of the ten components drawn correctly by the reader served as the measure of the effects of the writer on the reader. In addition, we assessed the structural accuracy by the counting the numbers of sentences written, the numbers of adjectives and adverbs used, structurally correct components, and the numbers of novel autoclitic frames used for each assignment. During baseline phases, no feedback was given to the students on their writing structure or function. During the teacher editing learn unit phase, the students edited and rewrote their essays until they met a criterion of 100% for accurate structural components after editing. During the final phase, the writer immersion plus the students viewing the effects their writing, the criterion was 100% for accurate structural components and 100% of accurate functional components after editing.

Interscorer agreement. Interscorer agreements were done by comparing the teacher and an independent reader measure of all aspects of the students' writing for 30% of all writing assignments. Each assignment constituted a session. Each had an unmarked copy of the functional components needed and produced the permanent product data individually. The teacher and reader recorded the numbers of components drawn by the reader, the numbers of words written, the numbers of adjectives and adverbs used, the numbers of novel frames, and the percent accurate structural components. Point-by-point inter-scorer agreement was calculated by dividing the numbers of agreements by the number of agreements and disagreements and multiplying by 100. Interscorer agreement was 98% for the functional effects, 100% for number of sentences written, 88% for numbers of adjectives and adverbs used, 100% for numbers of novel frames and 84% for the percentage of accurate structural components.

Results

Figure 3 shows the numbers of components of the drawing (colors, shapes, words, lines) the student described accurately measured by the components drawn by the naive reader. The naive reader for Student A's writing drew 2 of the 10 components of the drawing correctly during all of the baseline sessions. After teacher editing, the numbers of components drawn prior to editing ranged from 1 to 4, with a mean of 2.50. After the implementation of writer immersion, the numbers of components drawn prior to editing ranged from 5 to 10, with a mean of 7.33.

The numbers of components of the drawing drawn by the reader during baseline sessions ranged from 0 to1, with a mean of .80, for Student B. After teacher editing, the numbers of components drawn prior to editing ranged from 1 to 3, with a mean of 2.00. This increased to a range of 5 to 8, with a mean of 6.80 after the implementation of writer immersion package that included the students' viewing the effects of their writing.

After reading Student C's writing, the reader drew between 2 and 3 components of the drawing, with a mean of 2.83, during baseline sessions. After the teacher editing, the mean numbers of components drawn prior to editing ranged from 2 to 5, with a mean of 4.17. This

increased to a range of 9 to 10, with a mean of 9.5 components drawn by the reader after the implementation of writer immersion and self-editing.

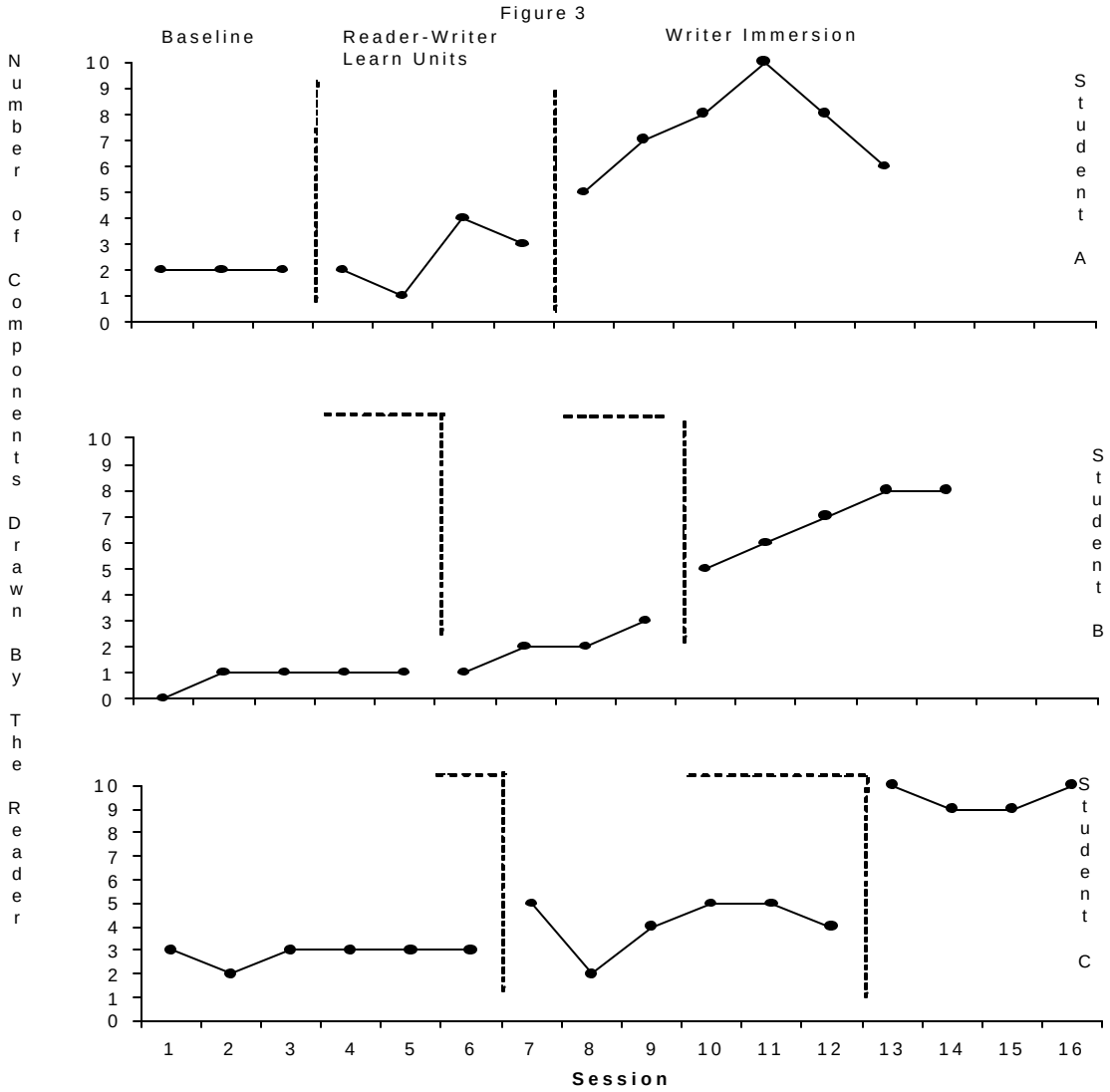

Figure 3. The numbers of components of the drawing drawn by an independent reader after reading essays prior to editing written by Students A, B, and C in Experiment 1.

Figure 4 shows the percentage of accurate structural components written on essays prior to editing. Student A emitted a mean of 30% accurate structural components during the baseline phase. This increased to a mean of 73.25% during teacher editing prior to rewriting and a mean of 88.33% during writer immersion. Student B emitted a mean of 26.60% accurate structural components during the baseline phases. This increased to a mean of 76.75% accurate structural components during reader/writer learn units prior to editing and a mean of 85.60% after the implementation of writer immersion. Student C emitted 46.67% accurate structural components

during the baseline phase, a mean of 70.17% accurate structural components during teacher editing on essays prior to editing, and a mean of 95% accurate structural components after the implementation of writer immersion and self-editing.

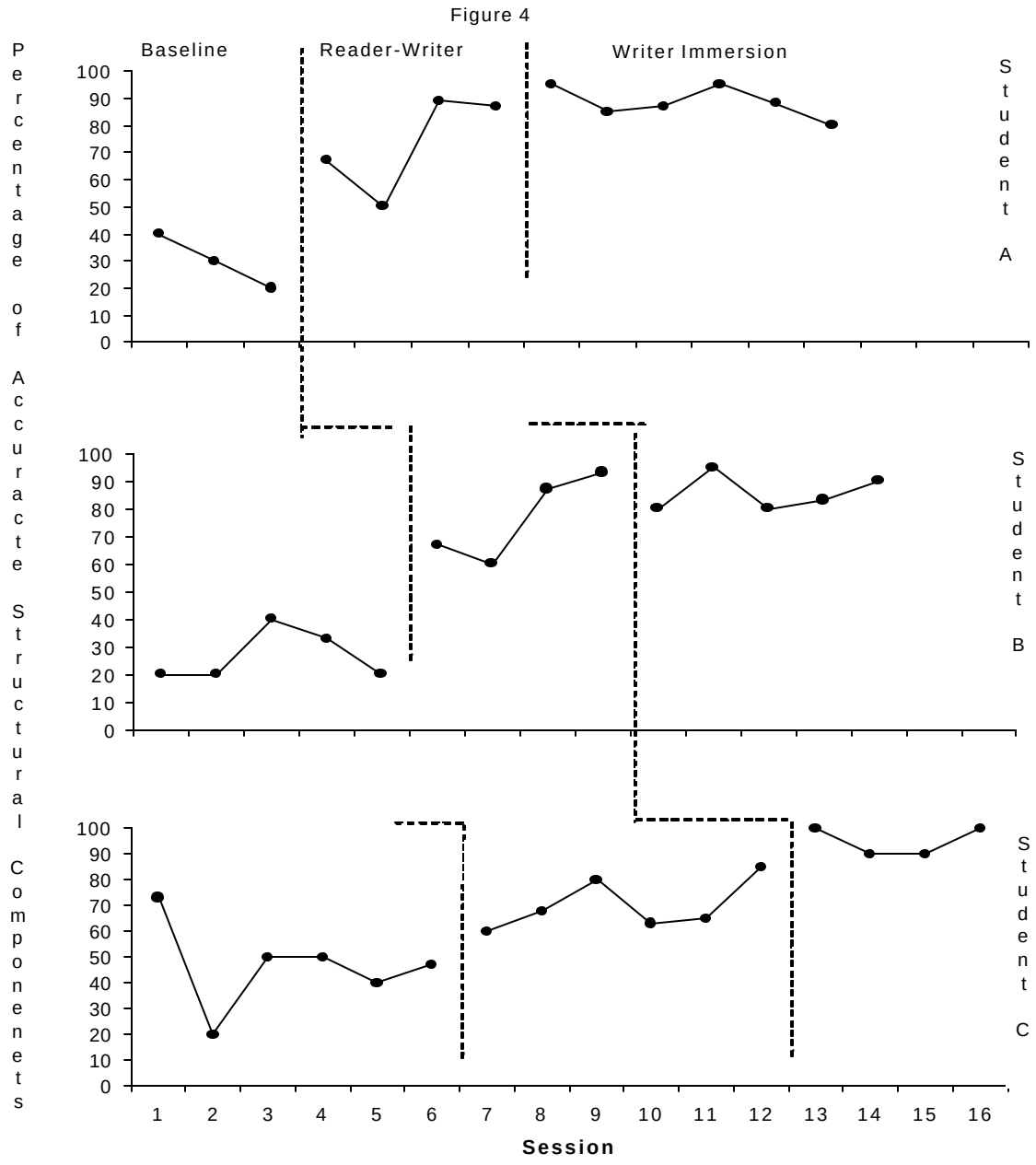

Figure 4. The percent accurate structural components in essays for each of the three phases prior to teacher editing are shown for Student A, B, and C in Experiment 1.

Data were also collected on the numbers of sentences written, the numbers of novel responses to sentence frames, and the numbers of adverbs and adjectives used. These data are

represented in Table 4. Although the data show only slight increases in each of these variables, the function and the accuracy of structure of the writing increased.

Table 4: Structural Components of Writing of Participants in Experiment 1

Mean Numbers of Sentences Written

Student	Baseline	Writer Immersion
Student A	1.00 sentence	8.83 sentences (range: 4-14)
Student B	1.80 sentences (range:0-3)	5.60 sentences (range: 7-14)
Student C	2.15 sentences (range: 1-3)	5.00 sentences (range: 4-6)

Mean Numbers of Adjectives and Adverbs Used

Student	Baseline	Writer Immersion
Student A	4.33 (range: 4-5)	33.50 (range: 16-73)
Student B	4.80 (range: 3-7)	9.60 (range: 7-14)
Student C	9.33 (range: 8-18)	13.33 (range: 13-21)

Mean Numbers of Novel Autoclitic Sentence Frames

Student	Baseline	Writer Immersion
Student A	1.00 (range: 1-1)	3.16 (range: 1-5)
Student B	1.80 (range: 1-2)	2.00 (range: 1-5)
Student C	1.33 (range: 1-2)	2.75 (range: 2-4)

Discussion

The data showed increases in the numbers of sentences written and the percent accurate structural components after the implementation of reader/writer learn units. However, the numbers of adjectives and adverbs used, the numbers of novel sentence frames, and the numbers of components drawn by the reader did not increase until after the implementation of writer immersion.

The use of the teacher/experimenter's learn units alone was not effective to teach middle school students the function of writing. The data showed a significant difference in the numbers of components drawn by the reader for all of the participants in this study after the implementation of writer immersion with the student's viewing the effects of their writing on the reader's drawings. This showed that writer immersion was an effective tactic for teaching middle school students diagnosed with behavioral and learning disabilities to write to affect the behavior of the reader. This tactic was also effective in increasing the numbers of sentences written, and the numbers of novel sentence frames and adjectives and adverbs used. As students wrote to affect the behavior of the reader, the numbers of novel responses increased.

Experiment 2 was a systematic replication of the first experiment with four new participants diagnosed with behavior disorders to further test the effects of writer immersion.

Since the results of Experiment 1 showed that teacher editing alone was not effective in teaching students to write functionally, only the package of writer immersion plus viewing the effects of the writing was implemented as a tactic in the replication. This avoided the possible cumulative effect of receiving learn units prior to the writer immersion package. That is, in the first experiment the effects of the second intervention could not be separated from any additive effects. The baseline phase was the same as Experiment 1 followed immediately by the implementation of the immersion with self-editing by the students after the students viewed the effects of their writing on reader's drawings. Another change in Experiment 2 was a change in the criterion for the structure and function of the student writing. In Experiment 1, the students were required to recycle, or rewrite the essays until they emitted 100% accurate structural components and 100% of the components were drawn by the readers as a result of teacher learn units alone. In Experiment 2, the performance criterion was the same; however, they had to meet the criterion prior to recycling. The students were required to write until accurate functional effects accrued and the structure was correct after viewing a picture for the first time.

Experiment 2

All of the components of the second experiment were the same as Experiment 1 except for the following: the participants differed, only writer immersion plus the students' viewing the effects of their writing constituted the independent variable package, and the criterion for mastery differed.

Method

Participants. Four students participated in Experiment 2. Student D was a 16-year-old female diagnosed with a behavioral disorder. The student functioned at approximately a 6th grade academic level. Student E was a 16-year old female diagnosed with a behavior disorder and functioned academically at approximately at 6th grade level. Student F was a 14-year old female diagnosed with a behavior disorder. The student functioned at approximately a 6th grade academic level. Student G was a 15 year old male diagnosed with a behavior disorder and functioned approximately at a 5th grade academic level. All of the students attended a 9th grade class at the same publicly funded school just outside a major metropolitan area utilizing a comprehensively behavior analytic educational model as those students who participated in the first experiment. Table 5 describes additional information about the participants.

Table 5: Participants in Experiment 2

Student	Student D: 9th grade student	Student E: 9th grade student	Student F: 9th grade student	Student G: 9th grade student
Level of Verbal Behavior	Reader/ Writer	Reader/ Writer	Reader/ Emergent Writer	Reader/ Emergent writer
Diagnosis	Behavior Disorder	Behavior Disorder	Behavior Disorder	Behavior Disorder
Functioning Grade Level	6th Grade	6th Grade	6th Grade	5th Grade
Repertoires	-High percentage of structural	High percentage of structural	-High percentage of structural errors in	-High percentage of structural errors in

errors in writing -Functional writing was not in student's repertoire	errors in writing -Functional writing was not in student's repertoire	writing -Functional writing was not in student's repertoire	writing -Functional writing was not in student's repertoire

Design. A multiple baseline design across students was implemented. A baseline phase, in which the participants described a picture and no feedback was given, was followed by the implementation of writer immersion with the provision of the opportunity to view the effects of the students' writing on the reader's drawings.

Dependent Variables. The dependent variables in Experiment 2 were the same as those collected in Experiment 1 with one exception-- data were not collected on the numbers of novel sentence frames.

Independent Variables. The tactic was implemented using the same procedures in Experiment 1. The students edited their own writing after viewing drawings done by a reader who was naïve to the conditions of the experiment. However, the criterion for effective writing was changed from the first experiment. In the second experiment the students continued in the writer immersion phase until their writing met a criterion of 100% accurate structural components and 100% functional components on essays prior to editing by the teacher-experimenter.

Interscorer agreement. Interscorer agreement was scored on the numbers of components drawn by the naïve reader, the numbers of words, numbers of sentences, numbers of adjectives and adverbs and numbers of structural errors recorded on each written paper as described in Experiment 1. Interscorer agreement was 100% for the numbers of components drawn by the naïve reader, 100% for the numbers of sentences written, 94% for the percent of accurate structural components, and 96% for the numbers of adjectives and adverbs used.

Results

Figure 5 shows the numbers of accurate components drawn by the reader per written assignment. The numbers of components drawn for Student D during the baseline phase was a mean of 3.33 (range of three to four) out of 10 possible correct components and increased to a mean of 8.00 (range of 2 to 10) during the implementation of writer immersion package prior to teacher editing. The mean numbers of components drawn on essays prior to editing for Student E increased from a mean of 2.75 (range of 2 to 4) during the baseline phase to a mean of 8.00 (range of 4 to 10) during the implementation of writer immersion. The numbers of components drawn increased for Student F as well, from a mean of 3.6 (range of 3 to 4) during the baseline phase to a mean of 6.53 (range of 1 to 10) after the implementation of writer immersion. For Student G, the numbers of components drawn by the reader on essays prior to editing increased from a mean of 4.00 (range of 3 to 6) during the baseline phase to a mean of 7.66 (range of 3 to 10) after the implementation of writer immersion. These data showed a significant increase in the writer's functional effects on the reader as a result of the writer immersion package involving the students' viewing the effects of their writing on the reader's drawings.

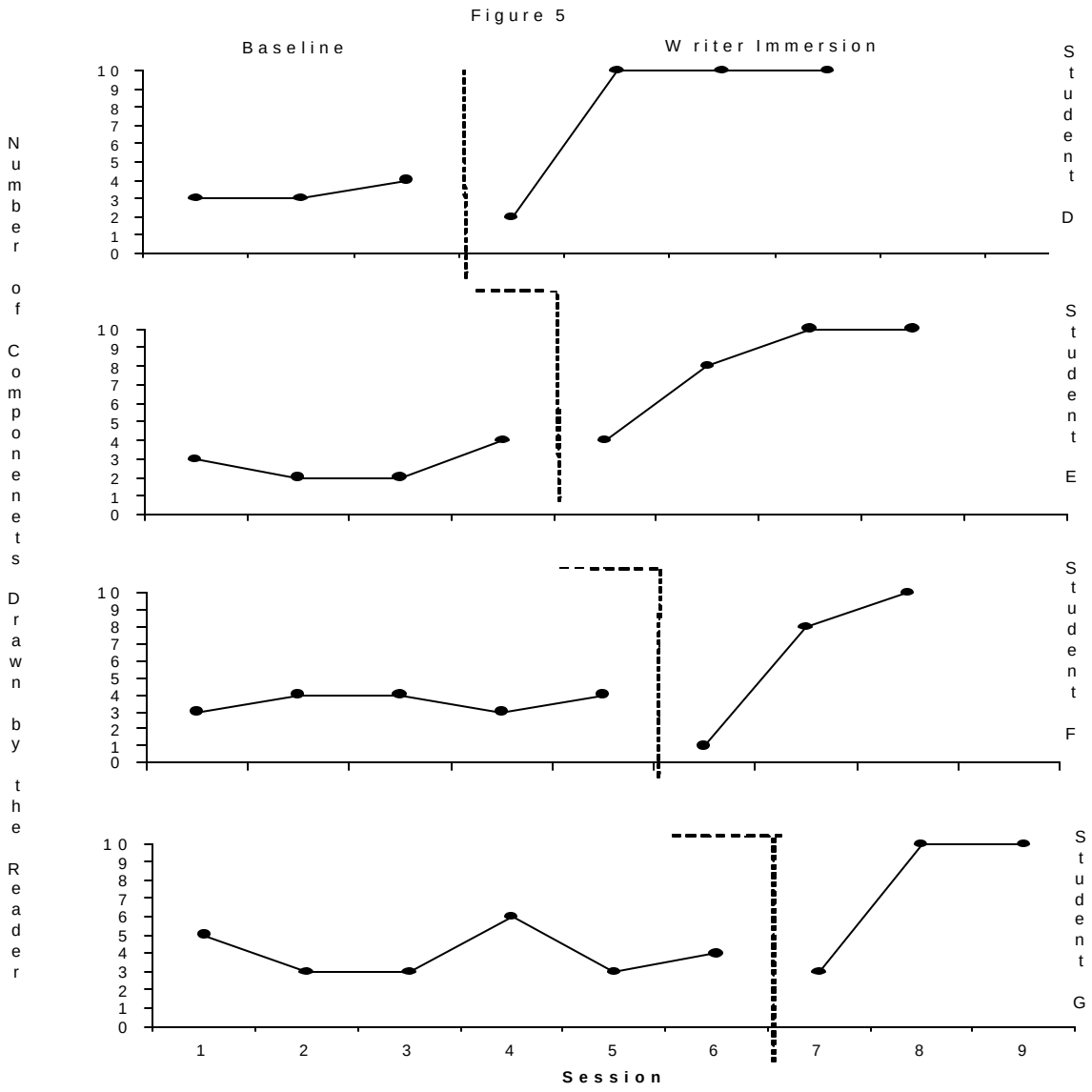

Figure 5. The numbers of components of the drawing drawn by an independent reader after reading essays prior to editing written by Students D, E, F, and G in Experiment 2.

Figure 6 shows the percentage of accurate structural components that was calculated by dividing the numbers of correct responses to spelling, grammar and punctuation and dividing by the total number of opportunities to respond within the written essay. The mean percentage of accurate structural components for Participant D increased from 53.33% (range of 40% to 60%) during baseline sessions to 77.50% (range of 60 to 100%) during writer immersion. The mean percentage of accurate structural components for Participant E increased from a 55.00% (range of 40% to 60%) during baseline to a mean of 75% (range of 40% to 100%) during writer immersion. The mean percentage of accurate structural components for Participant F increased from 20.00% during baseline sessions to a mean of 63.33% (range of 20% to 90%) during writer immersion. For Participant G, the mean percentage of accurate structural components increased from a mean of 43.33% (range of 40% to 60%) during baseline phases to 86.67% (range of 80% to 100%) during writer immersion.

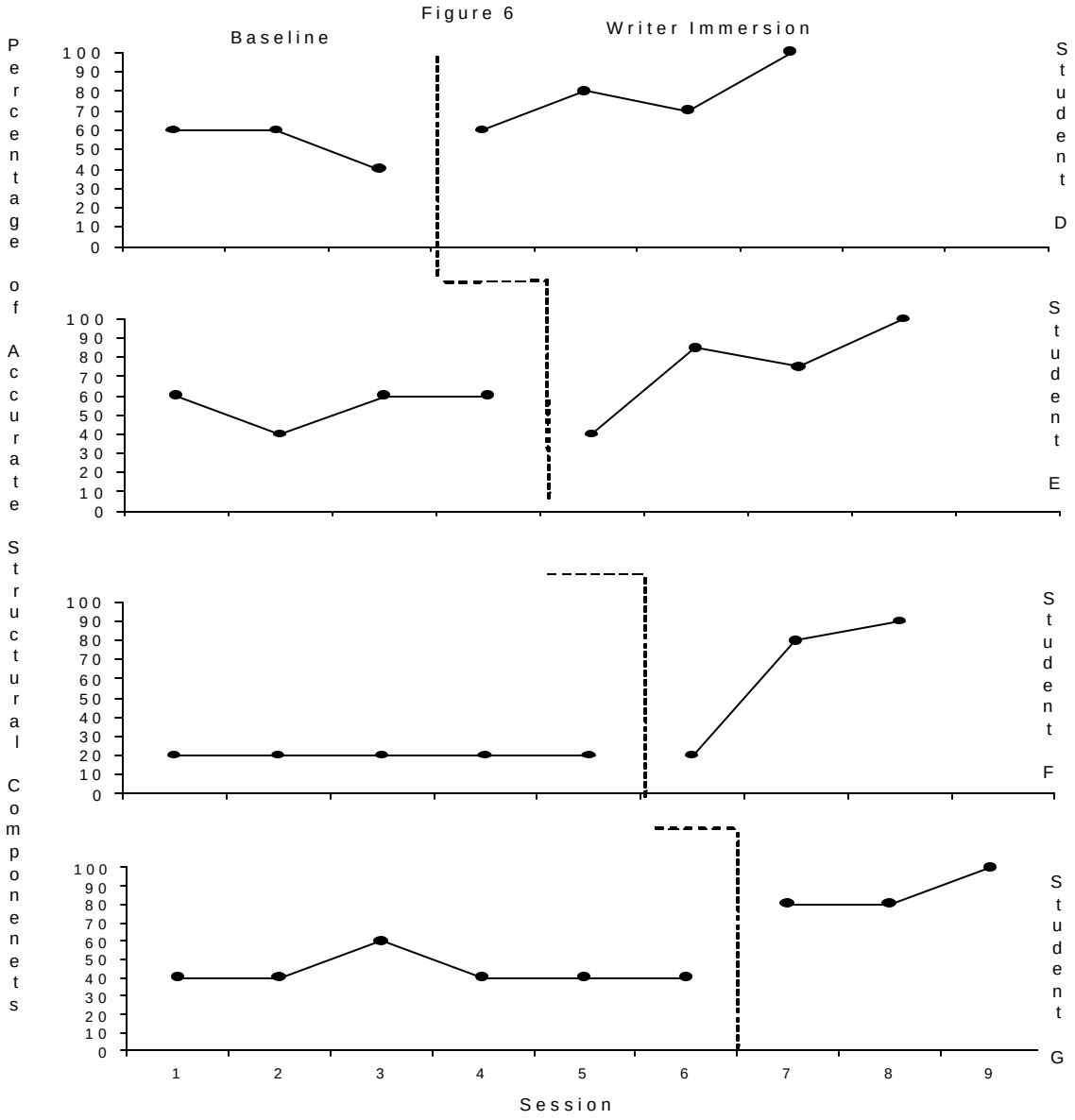

Figure 6. The percent accurate structural components in essays prior to editing are represented for Students D, E, F, and G in Experiment 2.

The numbers of adjectives and adverbs written for Student F and G and the numbers of sentences written for all students are shown in Table 6. There was a significant increase in the numbers of adjectives and adverbs used after the implementation of writer immersion.

Table 6: Structural Components of Writing of Participants in Experiment 2

Mean Numbers of Sentences Written

Student	Baseline	Writer Immersion
Student D	2.33 sentences (range: 1-3)	4.50 sentences (range: 1-6)
Student E	1.50 sentences (range: 1-3)	4.75 sentences (range: 1-7)
Student F	0.00 sentences	3.33 sentences (range:0-6)
Student G	1.00 sentence (range: 1-1)	4.00 sentences (range: 1-7)

Mean Numbers of Adjectives and Adverbs Used

Student	Baseline	Writer Immersion
Student D	4.00 (range: 2-4)	10.50 (range: 2-14)
Student E	N/A	N/A
Student F	2.80 (range: 2-4)	9.35 (range:0-16)
Student G	N/A	N/A

Discussion

There was a significant difference in the functional and structural components of writing after the implementation of writer immersion. The results of Experiment 2 demonstrate that writer immersion is an effective tactic to teach these students to write more functionally and also improve their accuracy in the use of the structural components of writing. Writer immersion taught the students to write to affect the behavior of the reader.

The results of the second experiment replicated the findings of the first experiment in that writer immersion is an effective tactic to teach students the functional components of writing. However, it also demonstrated that writer immersion was also effective in increasing the structural components of writing. This could not be determined from the first experiment since increases in the numbers of correct responses to grammar and punctuation were measured after the implementation of reader/writer learn units through teacher editing alone.

General Discussion

In Experiment 1, an effectiveness criterion for structure and function for the writer immersion was not specified. With the specification of criteria for writing in Experiment 2, data were collected until the students met the specified criterion for both structure (100% accurate structural components) and function (100% accurate functional components) on an essay prior to teacher editing feedback. The data also showed increases in the numbers of sentences and the numbers of adverbs and adjectives. As the student wrote to affect the behavior of the reader, the numbers of novel adjectives and adverbs increased. Because both functional effects and increases in the use of novel adjective-adverbs occurred, we speculate that the adjective-adverb usage functioned as autoclitics to affect the reader's behavior. Future research should directly test this

possibility. It would be beneficial to replicate the study with criterion specified for these autoclitic functions.

Jadlowski (1997) found that having a student writer edit another student's written responses while the teacher served as a reader for their written responses resulted in criterion in fewer recycles of their written responses. Thus the effect was due to the writer serving as an editor of other student's writing. Future studies should explore the effects of having students edit other students' papers as part of writer immersion package on the functional and structural components of writing.

Skinner (1957) suggested that different audiences should affect a writer such that the writer comes under the control of different target audiences. Future studies should address teaching students to write and self-edit to affect the behaviors of different audiences, and test the effects of different procedures on aesthetic writing.

The results of the present study together with the finding of other studies that were designed to teach writer function provide empirically based procedures for teaching the function of writing. The evidence from all of these studies suggests that teaching functional writing results in collateral improvements in the use of the structural components of writing. The establishing operation is key to teaching function whether the response is written or spoken. In summary, research in verbal behavior identifies how to teach the function of writing and this perspective advances the pedagogical procedures for teaching students to write well.

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