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Using graphic organizers to improve science outcomes

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USING GRAPHIC ORGANIZERS TO IMPROVE SCIENCE OUTCOMES

by

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Dedications

This thesis is dedicated to my son, Jameson Grey, for kicking mommy into high gear while hours were spent on research and writing time to complete another bucket list goal. Only a newborn when I started typing, you have given me the strength to continue to pursue my education and reach the finish line. To my husband, the patience and drive you have given me from the very beginning is what kept my passion alive. Finally, Dr. Sandra Schwartz for giving me a new home, new outlook, and friendly reminder that anything is possible.

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Abstract

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This study looked at the outcome of using graphic organizers to improve student outcomes in the content area of science for students with special needs in an inclusion class in a high school in New Jersey. In total, there were five participants in this study who were all eligible for special education services. Of the five students in the study, four are under the category Other Health Impaired, and one student is autistic. All participants were demonstrating grade level performance as determined by their baseline data collection.

The data from the study illustrated that all five of the participants demonstrated positive effects with the use of a graphic organizer. In the final week, students stated they only asked for minimal assistance to demonstrate to the teacher that they were on the right track. The use of graphic organizers proved very beneficial to the group of students with special needs so much that for two of the five it has become part of the students' IEP plan. Once the graphic organizer template was created and modeled, minimal time was needed to be put into place. When the students can then see the benefit to planning and preparing prior, they are then more eager to create and apply themselves independently and successfully.

Table of Contents

Table of Contents (Continued)

List of Figures

List of Tables

Chapter 1

Introduction

Science can be seen as a question and answer subject with much complexity tied in. Questions that ask how things work, or why things work, may seem simplistic, however the subjective complex thought process that ties within to create and find out if the hypothesis is true, can be more than just basic. With that being said, how does one successfully implement and teach these complex levels of content to those who require a more modified understanding?

Students with learning disabilities have a diverse way of learning. Students in general face multitudes of challenges, and more so when it comes to science due students with learning disabilities struggle. Science as mentioned previously is a question-based subject that embodies rich information and complex thought processes. Students with learning disabilities face challenges with reading, writing, organization, planning, and memorization. Some students may learn best with graphic organizers, while others rely on dual modalities of visual and audio representation. High order thinking, memorization, and problem-solving skills may be some of the areas that may be difficult for these learners, which may present a challenge when dealing with complex content in the subject of science. To combat this issue, teacher preparation on working with students with disabilities, as well as understanding the diverse techniques of how these students learn best should be emphasized. Utilizing effective study skills and organizational preparation for the content will further this study in looking into how students with disabilities can further grasp and obtain science content with high order thinking, memorization, and problem-solving skills.

The science curriculum is embedded with an ever-increasing array of thinking, study, and organizational skills that are predictors of future academic success (Everson, Weinstein, & Laitusis 2000; Zimmerman 2002). The demands for planning, prioritizing, time management and follow-through can be daunting for any student, but overwhelming for students with learning disabilities (Shmulsky 2003). Before students with learning disabilities can show mastery of content, they must first be explicitly taught effective ways to study and organize for their courses (Gersten, Schiller, & Vaughn 2000; Swanson, Haskyn, & Lee 1999; Vail, Crane, and Huntington 1999). McCleery and Tindal's (1999) study found that students with learning disabilities who were provided with an explicit, rules-based template for understanding the thinking behind scientific methods were able to outperform their peers who did not receive this explicit instructional support.

In this study, I examined the implementation of organizational skills and study skills of material within my Principles of Anatomy classroom. Half of the classroom consists of students with disabilities, and the content of the course is heavily loaded with memorization and application of material. Note taking, organizing material, and building basic study strategies, are skill sets that will help benefit students with learning disabilities within the class. By modeling and implementing the use of graphic organizers, and other organizing concepts, I believe that students will learn how to capture the basic understanding of the content and apply it to the overall topic at hand, as well as be able to study at a level that works best for them. By the second semester after observing students struggling to capture and apply notes given in the classroom, I revamped the direction of the classroom with a more student-led discussion, annotated

notes listed in graphic organizers, and practice graphic organizers given so that students can learn and visualize how to create their own for studying purposes. With the implementation of this new format, I was able to obtain a 50% increase with assessment scores, and overall participation.

Similar to other subject matters, Principles of Anatomy, or any science course, requires high order thinking to culminate a solution to a problem that is given, follow directions thoroughly by examining a situation, and being able to take the collected information and apply it. Students with learning disabilities struggle with high order thinking and application of the gathered data, as well as organizing it in a meaningful manner.

The following question examined in this study: Can the use of a graphic organizer improve student outcomes on lab and benchmark assessments? The study consisted of two sections from my Principles of Anatomy class with each class consisting of students with learning disabilities. In each class, 12 students are classified learning disabled with a total of 24 students in both classes combined for the study. One class was labeled the control group, where modifications for each student were carried out regularly; however, the use of graphic organizers and annotated notes on the board were not presented. The other section of Principles of Anatomy, the intervention group, received annotated notes in a graphic organizer format on the board, as well as a completed graphic organizer for studying the material for upcoming assessments.

The independent variable in this study was the use and implementation of graphic organizers for use of class notes and the improvement of study habits. Graphic organizers introduce structure and formatting organizational skills that can help facilitate

explicit objectives for students to utilize and meet to help organize the content. Graphic organizers—visual and spatial displays that make relationships between related facts and concepts more apparent—often are recommended as an instructional device to assist students with learning disabilities in understanding the increasingly abstract concepts that are presented in upper-elementary, intermediate, and secondary grades. Graphic organizers are intended to promote more meaningful learning and facilitate understanding and retention of new material by making abstract concepts more concrete and by connecting new information with prior knowledge (Hughes, 2011). Graphic organizers teach students to grasp the content in an organized manner so they can comprehend and apply the collected content at a level that works best for them, and easy recall when studying the material for future assessments. With a more neat and structured representation of material collected from the lecture, it is hypothesized that students will be able to retain more information and have it be more applicable when studying. The use of a graphic organizer will also help assist with labs so that students can properly deduce the information needed to create and solve a hypothesis to find an end result. The dependent variable being measured in the study is whether or not the use of a graphic organizer will result in an increase in an improvement in student results on lab and benchmark assessments.

In this study, the effects of the use of graphic organizers were evaluated to determine if there were positive effects on lab and benchmark assessments. If students received proper introduction on the use of a graphic organizer, then these students may be able to obtain better lab and benchmark assessment grades.

Chapter 2

Literature Review

According to data from the National Assessment of Student Progress (NAEP; U.S. Department of Education, 2009), only 11% of students with learning disabilities were at or above the proficient level for science compared to 35% of nondisabled peers in eighth grade. Further, 66% of students with learning disabilities were at or above the basic level for science compared to 33% of nondisabled peers in eighth grade. These troubling percentages are also reported in the science results of the NAEP for twelfth grade (U.S. Department of Education), where only 6% of students with learning disabilities scored at or above the proficient level and 70% scored at the below basic level, compared to 24% and 37%, respectively, for their nondisabled peers. It is abundantly clear that students with learning disabilities need assistance with science content.

In response to the recent amendments of the Individuals with Disabilities Education Improvement Act of 2004 (IDEA 2004) students with disabilities are being included more frequently in general education classrooms such as science. Furthermore, the No Child Left Behind Act of 2001 (NCLB 2001) regulations require that all students work on the appropriate grade-level curriculum. The science curriculum, Next Generation Science Standards, has flourished into a more student led based classroom where students are presented with an essential question for them to think on, hypothesize an understanding, and come to a conclusion. These abstract skills require higher order thinking, which for students with learning disabilities can be troublesome. Furthermore, the inclusion in a general education classroom promotes self-confidence, however the

requirement to retain the content using a skill set that may not be as prominent as that of a general education student presents a challenge for those students with learning disabilities. No more is the information strictly from the textbook. Science curriculum has changed in a way to present students with information that requires that they use their prior knowledge and new understanding of the concept. With the use of graphic organizers, students can focus more so on the important information presented in a visual outline and focus more so on understanding what is important to recall and retain.

Graphic Organizers and the Constructivist Approach

The implementation of graphic organizers has been widely assessed for the use in classrooms. The research that has been completed, and results collected, covers the effectiveness of graphic organizers on diverse types of learners in various subject areas. The current study examined the implementation of graphic organizers in a Principles of Anatomy class and whether it does or does not increase overall lab and benchmark assessment scores.

There are numerous studies that have been completed to find out how effective graphic organizers are in the classroom for students with learning disabilities. The required curriculum that is ever changing and requiring more student-led discussions presents a challenge for students with learning disabilities. Students may be intrigued and interested in the content, however the expectations of how the content is presented and at a higher order thinking level puts students with learning disabilities at a disadvantage.

The collaboration of student and teacher in the creation of graphic organizers presents the lesson with a more creative overview using images and map-like charts to

target the essential information that needs to be gathered. Students are often unsure about what information they should capture and focus on and students with learning disabilities often do not have the skill sets that allow them to utilize their higher order thinking skills to organize and collect information. Using the graphic organizer as an instrument to target and construct the vital information, students with learning disabilities can visually see the essentials, and furthermore memorize the content better for assessments.

Effectiveness of Graphic Organizers

Evidence has suggested that using various scaffolding and structuring tool are useful in helping students with learning problems overcome such difficulties (Bos & Anders, 1990; Bos, Anders, Filip, & Jaffe, 1989; Darch & Carnine, 1986; Gajria, Jitendra, Sood, & Sacks, 2007). Students with learning disabilities need structure and organization. If students are presented with an organized approach to content, prior knowledge combined with new knowledge will be more retainable because of the connection made in an organized manner. Visuals are essential to many students with learning disabilities because they provide a dual modality. The visual presentation of content within a graphic organizer also grants students with learning disabilities less time and effort in processing information and because the information is visually stored in an organized manner, it is possible to benefit from the visualization to recall information. Stull and Mayer (2007) explained the effectiveness of the student-constructed graphic organizers based on the activity theory. According to this theory, when the students engage in productive learning activities, deep learning is acquired (Kirschner, Sweller, & Clark, 2006; Mayer, 2004). Construction of the graphic organizers is a productive learning activity. One can state that the activity theory is based on the idea that deep

learning occurs when students are encouraged to engage in productive learning activities. During this process, the students select the relative ideas from the text, organize the ideas in the graphic organizer and show the relations of the ideas.

Review of Graphic Organizers and Science Instruction

As students progress through school, the content presented and the heightened academic demands to retain and apply the content increases. Science content specifically increases with abstract concepts requiring students to tap into their higher order thinking skills and memorization of prior knowledge. These skill sets are somewhat troublesome for students with learning disabilities to access and the increase demands only allow for more of an issue for these students to retain and recall the presented content (Mastropieri, Scruggs, Boon, & Carter, 2001; Mastropieri et al., 2006). While these factors present academic hurdles to all students, they are particularly challenging for students with learning disabilities. The quantitative research outcomes for this investigation compared differentiated hands-on activities versus teacher-directed instruction for students with learning disabilities. The study consisted of 213 students over a 12-week period. The experimental group was given differentiation, hands-on instruction, and peer mediation, while the control group was given traditional science instruction. After the 12-week period, it was found that the collaborative hands-on activities facilitated learning of the science content posttests and state high-stakes tests. The use of peer mediation hands-on activities provided review and practice for students with learning disabilities further assisting them to success.

Effectiveness of Graphic Organizers on Comprehension

Learners need to understand the context and the structure of the text in order to understand the content, yet many students lack the necessary skills to comprehend the complex relationships among ideas, facts, and concepts often found in social studies. Farris (2001) suggested that graphic organizers give the students control over the text and assist in comprehension. Gallavan and Kottler (2007) suggested that graphic organizers aid in students' motivation, short-term recall, and long-term achievement by allowing students to summarize, manipulate, and manage the complex curriculum. Results from the research from a pre-test and post-test of 15 true/false questions, multiple choice questions, and matching questions showed that when the students utilized a graphic organizer, the comprehension completion was successfully completed versus no use of a graphic organizer to complete the comprehension.

Research suggests that graphic organizers provide multiple benefits for students with disabilities. They allow access to the content, provide tailored instruction to meet student needs, and support learning the curriculum in the classroom (Scruggs, Mastropieri, & Okolo, 2008). The investigation was a comparison of traditional instruction and class wide peer tutoring using materials embedded mnemonic strategies to provide strategic information. Inclusion classes with 186 students were part of the investigation. Of the 186 students, 42 students were classified with mild learning disabilities. Over the 10-week investigation, all students were given a pretest, three unit tests, and a final posttest. The experimental group outperformed the control group on content learned and content taught directly in the experimental group as well as nontarget content. Students with disabilities have shown to benefit from the use of graphic

organizers due to the fact that they reduce the cognitive demand on learning and aid in recalling information quickly and clearly. Graphic organizers also help students with disabilities to organize the content, take concise notes, retain, and apply what they have learned (Walch, 2005).

Graphic Organizers to Increase Student Achievement

With the use of this tool, organization and retention of content will become more manageable for students with learning disabilities. Hamilton (2000) found that graphic organizers and guided notes provided a concrete set of notes for students to study which raised their test scores. The investigation compared guided notes and own notes conditions on students' note taking accuracy and next-day quiz scores. Seven students participated, and six out of the seven were students with learning disabilities. The experimental group that was given organized guided notes took more accurate notes. On the next day quiz, the scores increased. Six of the 7 students preferred using guided notes during the class after the investigation. The investigation also included another group of participants with 27 students enrolled in an undergraduate psychology course. The results showed that there was more student participation and an increase in quiz grades when using organized guided notes. The overall preference was the guided notes instead of producing their own notes during the class lectures. Each study also found that graphic organizers help the students get accurate notes, which would transfer over to providing more accurate answers on the test.

A study completed by Ermis (2008), students in second, fourth, and fifth grade completed assessments evaluating their level of comprehension. The independent variable was the use of graphic organizers. The dependent variable was the overall effect

that the graphic organizers had on comprehension. A total of 35 students were selected for the study. In the study, a pre and posttest was given with the control group receiving traditional literacy instruction when students read and discussed questions. The experimental group utilized the same texts, however they also had modeling on how to construct a graphic organizer alongside the texts. Ermis (2008) states his overall results for both experimental and the control groups had similar outcomes. The results with the introduction of the graphic organizer on the posttest were higher than those who received traditional read-and-discuss instruction only. With the use of graphic organizer instruction, construction, and implementation, the experimental group saw improved test scores.

Summary of Major Graphic Organizer Research Findings

Graphic organizers encourage higher order thinking, which may be hard for students with learning disabilities. In the study by Ellis (2008), it was found that there was an overall positive effect with the implementation using graphic organizers for students with learning disabilities. The experimental group who experienced positive effects with the graphic organizer was presented with at least one good example of a completed organizer. The fully completed organizer gave students an overview of what it should look like, and how it should be completed. Second, the instructor modeled how to complete the organizer using the completed one first, and then a blank one that students will be responsible to complete. After modeling, the step by step of how to complete the organizer was provided in a checklist format so students can successfully complete their organizer. Coaching was provided throughout the process with opportunities to practice before finalization of the graphic organizer. Results showed that these students were

successful in working in any content area utilizing this process versus students who simply were given read aloud directions minus the graphic organizer. It supported the theory that graphic organizers accommodate the organization, clarity in format, and structure for these students. Elementary-age students with learning disabilities learned significantly more social studies and science content when taught with visual displays than when taught by a teacher-directed activity involving reading and discussing text (Darch & Carnine, 1986). The question no longer focuses on whether graphic organizers are useful and effective tools to utilize in the classroom, but rather how can these visual and rich tools be effectively implemented in the classroom to meet all the diverse learning needs of students with learning disabilities.

Chapter 3

Methodology

Setting and Participants

The purpose of this study was to investigate if using graphic organizers improves the science outcomes of students within a high school science classroom. The students are enrolled in a high school in a suburban New Jersey school district. The district has one high school and seven elementary schools. Within the high school there are approximately 1,200 students. School data sources report that 73% of the students are white, 22% of the students are Asian, 4% of the students are Hispanic, and 1% of the student population is Black. The primary language spoken in the community is English. With the current year enrollment by program participation, 14% of the student population are students with disabilities, 3.6% of the student population are economically disadvantaged students, and English Language Learners account for 1/3% of the student population.

Of the 5 students in the study, 3 are female and 2 are male, four have been classified as "Other Health Impaired" (ADHD) and one student is autistic. Of the 5 students, 4 students are White/Caucasian, and 1 student is Hispanic.

Participant 1. AB is an eleventh grade Caucasian, female student who has an Individualized Education Plan. AB classification is under Other Health Impaired (OHI). AB receives in class support for Science, Language Arts and Mathematics is resource room setting. AB does well keeping notes in class; however the application of the information from notes to lab assignments or assessments is where she struggles most.

Participant 2. NO is an eleventh grade Caucasian, female student who has an Individualized Education Plan. NO classification is under Other Health Impaired (OHI) and Attention Deficit Hyperactivity Disorder (ADHD). NO receives in class support for Science, Language Arts and Mathematics. NO does not participate much in class and would benefit greatly with more review of materials for assessments. Retaining the information is where NO struggles the most.

Participant 3. AM is an eleventh grade Caucasian, female student who has an Individualized Education Plan. AM classification is under Other Health Impaired (OHI). Although AM receives in class support in science class, she overall does very well. The memorization of material at times can be troublesome for her at times, as well as the organization of notes.

Participant 4. AD is an eleventh grade Caucasian, male student who has an Individualized Education Plan, as well as a behavior plan. AD classification is under Attention Deficit Hyperactivity Disorder (ADHD) and Autistic. AD has transitioned from a one-on-on paraprofessional, to in class support for all his classes. AD struggled with organization and completion of assignments for class. If assignments are not noted, AD will assume they are not to be completed. His behavior plan consists of routine to-do's to help assist with goals and objectives for organization and completion of assignments.

Participant 5. AP is an eleventh grade Hispanic, male student who has an Individualized Education Plan. AP classification is under Attention Deficit Hyperactivity Disorder (ADHD). AP receives in class support for Science, Language Arts, and Mathematics is resource room. AP is determined to complete all his assignments in class,

however memorization of material and application are his biggest struggle. Assignments are always completed on time if not before, and his mother would like him to practice more independence prior to senior year in preparation for college.

Procedure

Prior to implementation of the intervention, a baseline measurement was collected based on student's current average without the usage of a graphic organizer. The data collected included grades measured from the student's organization skills with the collection of content, as well as their capability to collect the content, retain the content, and reword it. The note organization score checklist (see figure 1) consisted of "Do Now" questions and answers copied, power point notes, and notes demonstrating examples of student understanding. For the first week, students received either a "Yes" or No for each of the criteria on the checklist (see below for checklist) and the total was calculated into a point scale that was then average for a final single grade representation. All participants were made aware of the checklist and requirements expected and that the checklist would not impact their grade if they missed parts of the checklist.

The intervention phase took place during two weeks of lab classes as well as non-lab classes. Students worked in small groups after class discussions occurred to review notes and further discuss. Group 1 consisted of the 3 eleventh grade female students and Group 2 consisted of the two eleventh grade males.

The intervention consisted of student-led discussions in the classroom. When students shared their thoughts on the discussion, this aided the teacher in a better understanding of their overall understanding. The discussion of the intervention components and overall responsibilities were shared with the collaborating teacher.

During the intervention phase of the study the graphic organizer was taught to the students and implemented. The graphic organizer (see figure 2) consisted of titles and subtitles to help lead students throughout the note collection portion of the class. A completed model of the organizer was given for day one of notes to model and help visualize how to complete it. Students continued to use the note checklist, however they were given a graphic organizer at the start of class to input notes into instead of in their notebook like in week one. The students were given more responsibility as opposed to the first week where students in the first week had more modeling and teacher guidance and in the second week with checking off their note checklist as a way to self-check and help keep with the organization theme. The graphic organizer completion took the place of completion of notes from the PowerPoint. Students also were informed that the completion of the graphic organizer had to be fully completed for a "Yes" on the checklist, and to be mindful of overloading the graphic organizer with too many notes.

One student was given an additional copy of the note checklist to keep stapled in his notebook as a visual reminder. Parental signature lines were included for his parent to sign and be made aware of the progression in class. Other students asked if they too could have an additional copy so they can monitor their progression and stay on top of required elements of the checklist. At the end of the two weeks, students were able to tally their point scales on their checklist and first see if they were able to complete all required assignments. Once submitted, students received the checklist back showcasing grades from week one to week two. Students were able to see their progression with the use of the implementation of the graphic organizer and overall organization of notes.

A final phase was added to observe if students continued implementation of the graphic organizer and if they were, were their grades consistent from the second week of implementation. Students continued to use the graphic organizer and became more independent with creating and formatting what works best for their studying. One student removed the boxes from the graphic organizer and used bullet notes mimicking the graphic organizer set up, but without the outlined boxes. All participants were able to utilize the graphic organizer and still maintain improved grades.

Variables

The independent variable in the study was the implementation of the graphic organizer and note organization checklist. This intervention aimed to increase students' lab and benchmark assessment grades and improve the organizational skills. The dependent variables in the study were the students' grades and the organizational checklist scores.

Experimental Design

This study utilized a single subject, multiple baseline model with two phases. The first phase consisted of no graphic organizer. During the second phase, the graphic organizer was introduced. A third phase was added as a continuation of assessment with student use of graphic organizer and overall grades.

The note organization score checklist consisted of "Do Now" questions and answers copied, power point notes, and notes demonstrating examples of student understanding.

NOTE ORGANIZER CHECKLIST X – COMPLETED 0 – NOT COMPLETED			
Do Now Question	**Do Now Completion**	**Power Point Notes**	**Your Interpretation**
Week 1 _____	**Week 1** _____	**Week 1** _____	**Week 1** _____
Week 2 _____	**Week 2** _____	**Week 2** _____	**Week 2** _____
Week 3 _____	**Week 3** _____	**Week 3** _____	**Week 3** _____
Total Points: _____	**Total Points:** _____	**Total Points:** _____	**Total Points:** _____

Figure 1. Note organizer checklist

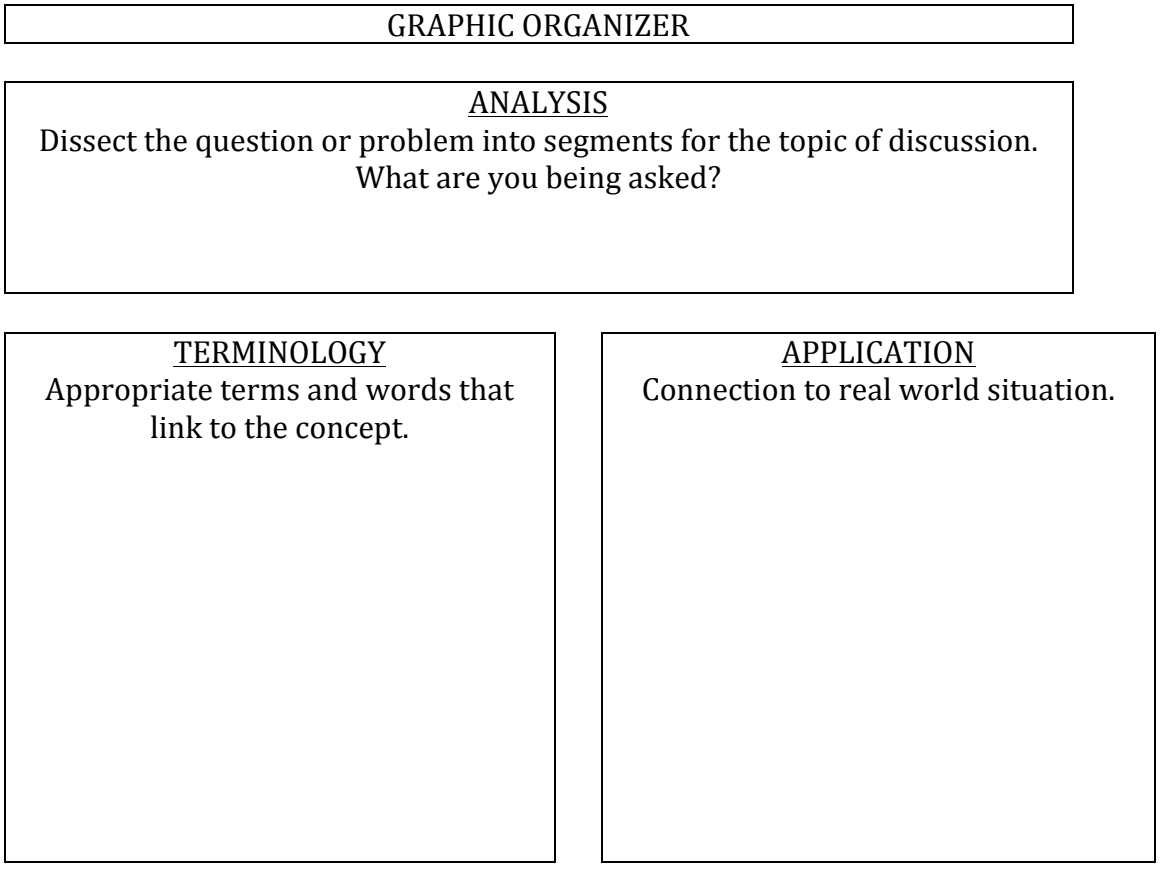

Figure 2. Graphic organizer

Chapter 4

Results

Summary

In this single subject design, the implementation of a graphic organizer to increase lab and benchmark assessments was examined with five students with disabilities from a high school science inclusion class. The research questions to be answered were:

1. If graphic organizers are modeled and implemented in the classroom, will students with disabilities learn to properly organize and memorize the content?
2. Would the use of pre-made graphic organizers help on the students' in independently creating their own graphic organizer?
3. Will students be able to take information from class-led discussions and independently create a graphic organizer to organize their content?

The five students who were subjects of this study were assessed the first week of the study to collect data on their overall lab and benchmark grades without the use of a graphic organizer. The assessment measured student's organization skills with the collection of content, as well as their capability to collect the data, retain the data, and reword it. The overall grade average per student was used to set a grade point for the baseline, intervention, and the final week of the study which included a collection of grades averaged into a single grade to represent how their overall collection of content, retaining of content, and ability to reword content was measured.

Group Results

The results for each student in all three phases of the study (baseline, intervention, independent) are reported in Table 1.

Table 1

Baseline, Intervention, Post-Intervention and Overall Difference

B – Baseline **IP** – Intervention Phase **PI** – Post Intervention	Week 1: No Graphic Organizer/ Teacher Model			Week 2: Graphic Organizer/ Teacher Model			Week 3: Independent Use			Difference Between Baseline and Post-Intervention		
Student	**B**	**IP**	**PI**	**B**	**IP**	**PI**	**B**	**IP**	**PI**	Week 1	Week 2	Week 3
1	85	89	90	90	92	92	88	89	85	5.7%	2.2%	3.5%
2	80	85	85	88	89	95	90	92	92	6%	7.7%	2.2%
3	70	71	71	73	76	78	75	76	78	1.4%	6.6%	3.9%
4	90	93	99	98	98	98	97	97	98	9.5%	0%	1%
5	83	85	86	89	89	92	88	88	90	3.6%	3.3%	2.2%
Mean	82	85	86	88	89	91	88	88	89	4.8%	3.4%	1%

The data collection was taken over a three-week consecutive span. During the baseline phase, the data collected included grades earned at the start of the intervention, note organization score checklist, and any assignments that were missing in that first week. The note organization score checklist consisted of "Do Now" questions and answers copied, power point notes, and notes demonstrating examples of student

understanding. During the intervention phase, each of the five students were introduced to a completed graphic organizer and a blank graphic organizer. Students followed along during discussion using the completed one as a template to showcase how notes were translated, organized, and overall placed accordingly. The second graphic organizer they were given was blank. The purpose of the second organizer represented teacher modeling on how to complete the graphic organizer, and where to place notes, the students were expected to follow along and repeat each step as the teacher modeled the steps. All five of the students followed along and completed their graphic organizer. Lastly, the post-intervention was to assess student completion of a graphic organizer without modeling from the teacher, and without guidance of how to organize and complete the notes. An overall mean was tabulated after utilizing the graphic organizer.

When looking at the overall group scores, the students had an 82 for an average grade in week 1 during the baseline phase. When the introduction of the graphic organizer took place in week 1, the average score was 85 with a post-intervention mean of 86. In Week 2 when modeling and guidance of the use of a graphic organizer was introduced, the baseline score was an 88, improving to 89 when the intervention occurred, and a 91 during the post-intervention phase. Finally, in week 3 when students were to independently complete a graphic organizer, the results for the baseline and intervention phases, was 88, and 89 for the post-intervention stage. The overall mean results for the overall students showed a baseline versus post-intervention difference of 4.8% difference in week 1, 3.4% difference in week 2, and 1% difference in week 3. The five students showed increasingly better performance when interventions were made and the teacher modeled or guided them with completion of the graphic organizer. Three

students made drastic differences in grades in week one when teacher modeling occurred after assessment one was given with no modeling or use of a graphic organizer for preparation.

Individual Results

Figure 3 illustrates overall results for student 1 of each of the three weeks on the baseline, intervention, and post-intervention. During the baseline phase, Student 1 had an 85, 90, and then an 88. During the intervention phase, the grades for the three weeks were 89, 92, and an 89. In the final post-intervention phase, the grades were 90, 92, and an 85. The mean scores during each phase are shown in Figure 4.

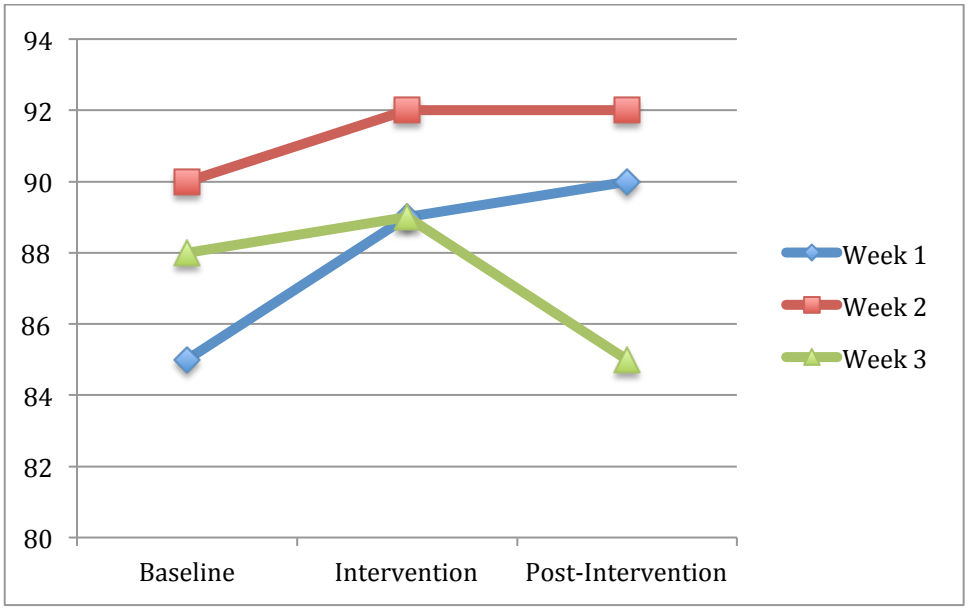

Figure 3. Student 1 baseline phase weeks 1-3

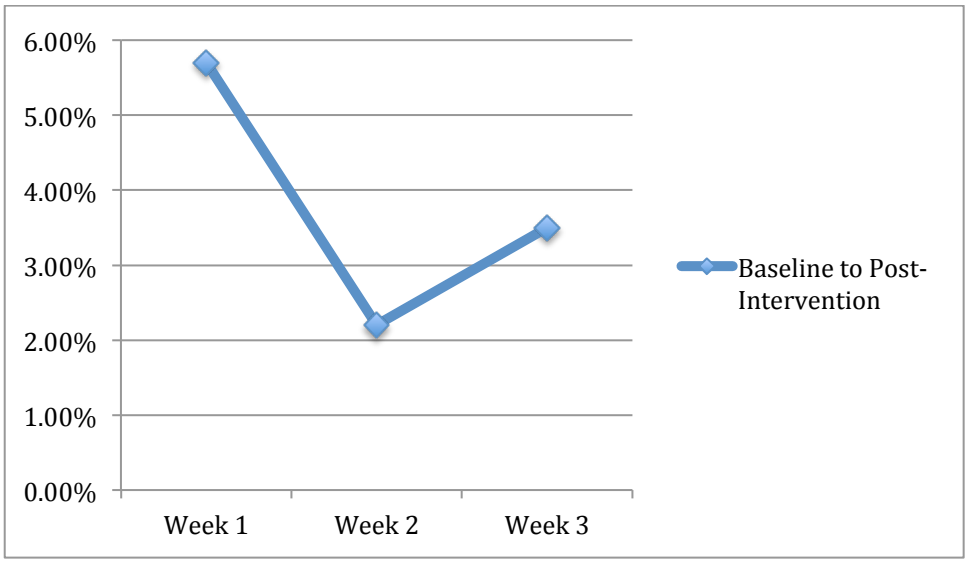

Figure 4. Student 1 Baseline to post-intervention percent difference

Figure 5 illustrates overall results for Student 2 of each of the three weeks on the baseline, intervention, and post-intervention. During the baseline phase, Student 2 had an 80, 88, and a phase, the grades for the three weeks were 85, 89, and a 92. In the final post-intervention phase, the grades were 85, 95, and a 92. The mean scores during each phase are shown in Figure 6. 90.

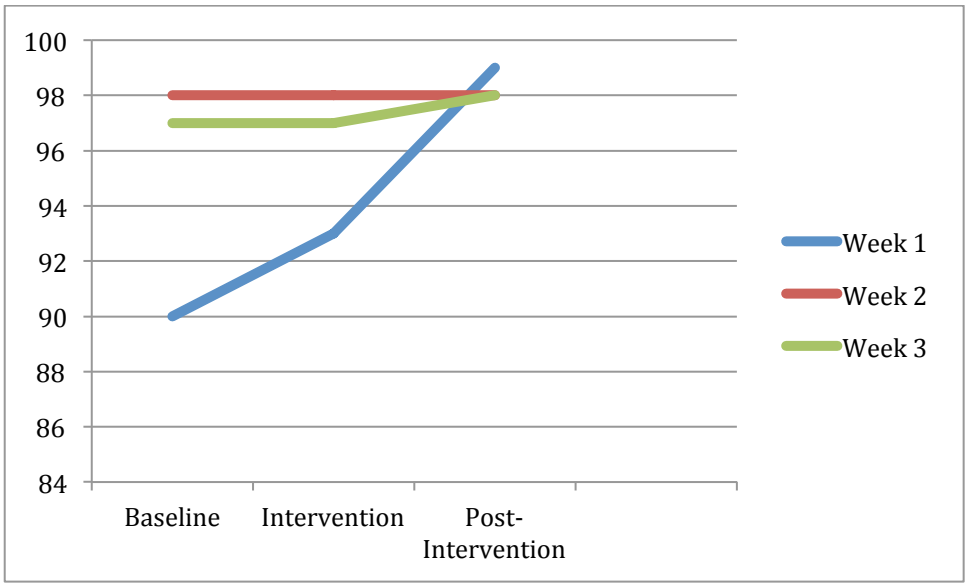

Figure 5. Student 2 baseline phase weeks 1-3

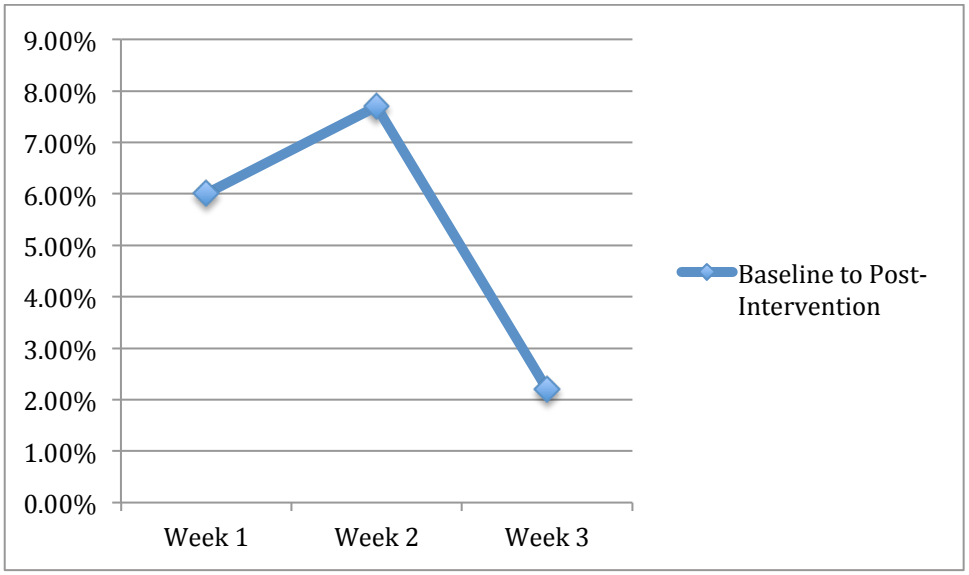

Figure 6. Student 2 baseline to post-intervention percent difference

Figure 7 illustrates overall results for Student 3 of each of the three weeks on the baseline, intervention, and post-intervention. In the baseline phase, Student 3 had a 70,

73, and a 75. During the intervention phase, the grades for the three weeks were 71, 76, and a 76. In the final post-intervention phase, the grades were 71, 78, and a 78. The mean scores during each phase are shown in Figure 8.

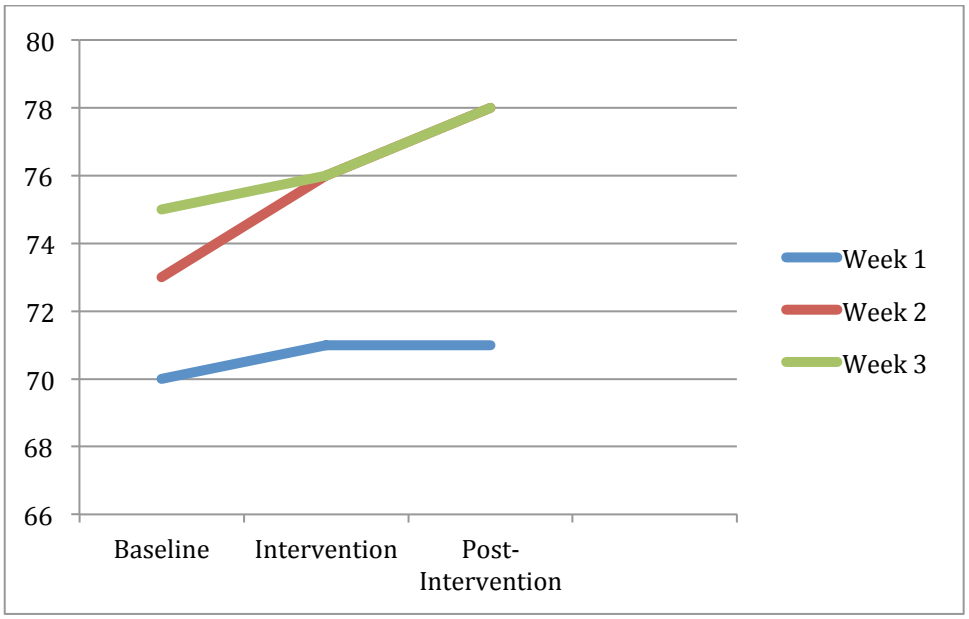

Figure 7. Student 3 baseline phase weeks 1-3

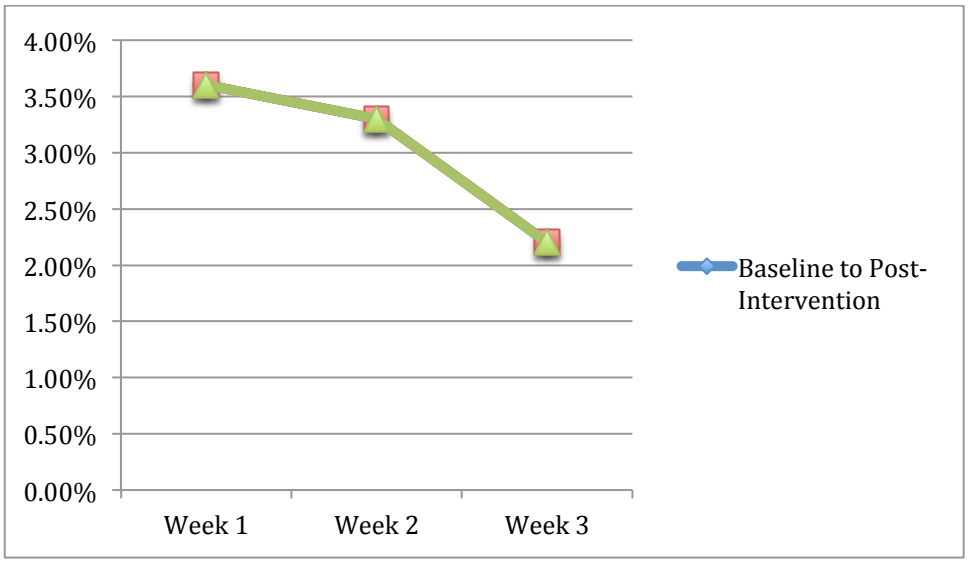

Figure 8. Student 3 baseline to post-intervention percent difference

Figure 9 illustrates overall results for Student 4 of each of the three weeks on the Baseline, Intervention, and Post-Intervention. During the baseline phase, Student 4 had a 90, 98 and a 97. During the intervention phase, the grades for the three weeks were 93, 98, and a 97. In the final post-intervention phase, the grades were 99, 98, and a 98. The mean scores during each phase are shown in Figure 10.

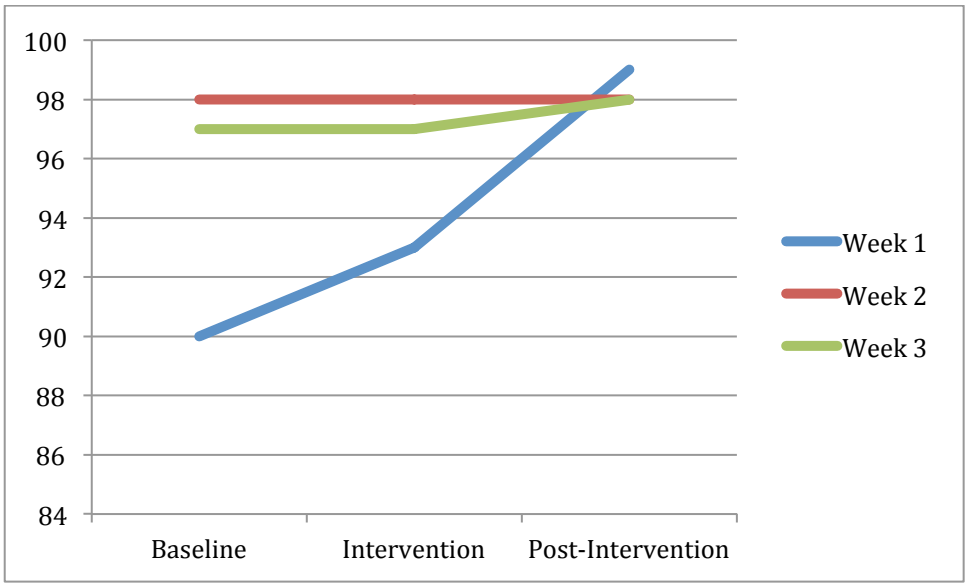

Figure 9. Student 4 baseline phase weeks 1-3

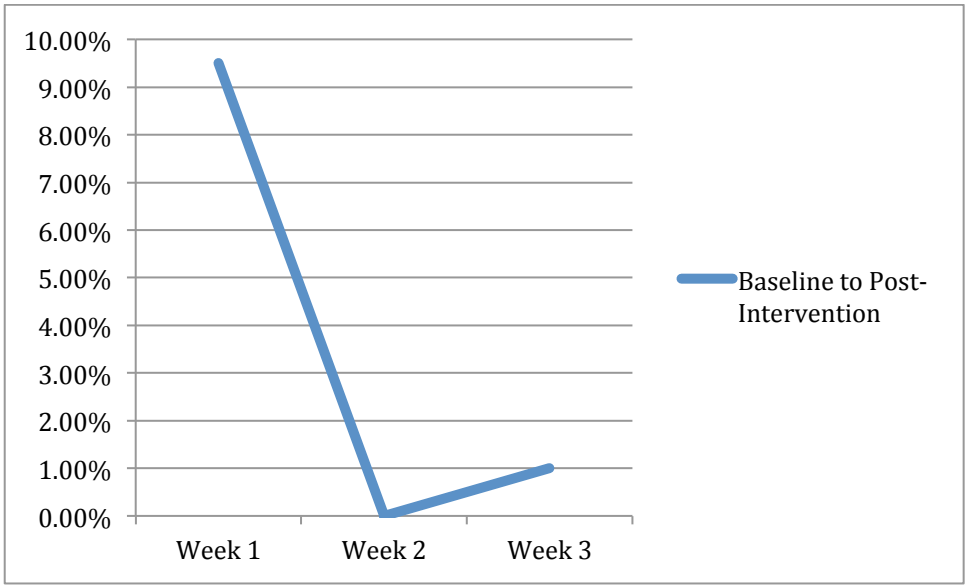

Figure 10. Student 4 baseline to post-intervention percent difference

Figure 11 illustrates overall results for Student 5 of each of the three weeks on the baseline, intervention, and post-intervention. During the baseline phase, Student 5 had an

83, 89 and then an 88. During the intervention phase, the grades for the three weeks were 85, 89, and an 88. In the final post-intervention phase, the grades were 86, 92, and a 90. The mean scores during each phase are shown in Figure 12.

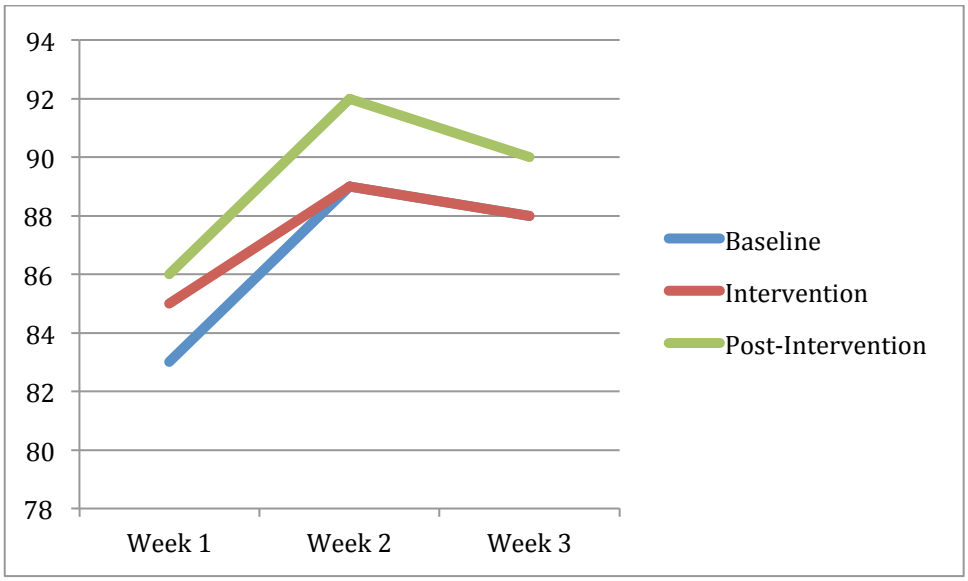

Figure 11. Student 5 baseline phase weeks 1-3

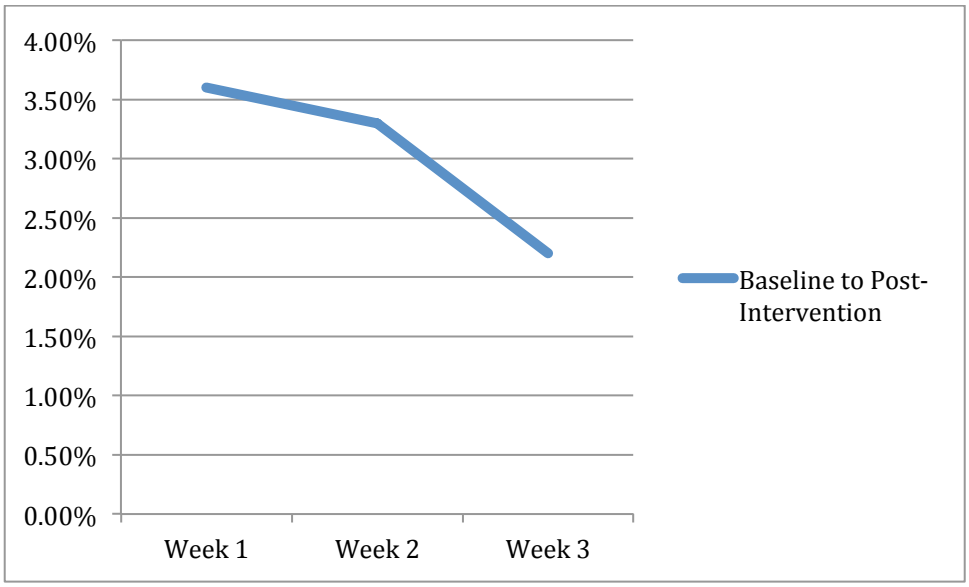

Figure 12. Student 5 baseline to post-intervention percent difference

Chapter 5

Discussion

Review

This study examined the effectiveness of using graphic organizers to improve outcomes in the content area of science for students with special needs in a junior and senior inclusion class in a high school in New Jersey. In total there were five participants in this study who were all eligible for special education services. Of the five students in the study, four are under the category as Other Health Impaired, and one student is classified as autistic. All participants were exhibiting a need for improvement at their grade level performance as determined by their baseline data collection.

With the introduction of a graphic organizer, the students achieved an overall increase with the ability to collect data and retain it better. Using the graphic organizer helped the participants retain content in a more organized manner, which increased their overall memorization skills on the content. Final baseline scores showcased positive effects with the use of the graphic organizer from week 1 to week 3 with little to no teacher assistance. Every participant was able to successfully use and create a graphic organizer at the culmination of the study. Each participant was expected to utilize and create their own graphic organizer for this study to increase their organization, memorization, and application of content. Each week was measured with a baseline collection, intervention phase, and a post-intervention. Two of the five participants (Participants 1 and 3 both classified Other Health Impaired) had the highest increase in percentage in the final week of the study.

Previous Research

The science curriculum is embedded with an ever-increasing array of thinking, study, and organizational skills that are predictors of future academic success (Everson, Weinstein, & Laitusis 2000; Zimmerman 2002). The demands for planning, prioritizing, time management, and follow-through can be daunting for any student, but overwhelming for students with learning disabilities (Shmulsky 2003). This study focused heavily on high order thinking, memorization, application and organization skills of those by the participants.

Graphic organizers are intended to promote more meaningful learning and facilitate understanding and retention of new material by making abstract concepts more concrete and by connecting new information with prior knowledge (Hughes, 2011). Continuation of exposure to the organization of content in a more manageable format, led to a clutter free space where only content of importance showed through.

McCleery and Tindal's (1999) study found that students with learning disabilities who were provided with an explicit, rules-based template for understanding the thinking behind scientific methods were able to outperform their peers who did not receive this explicit instructional support. In the present study, when teacher modeling and organized template creations were provided, students applied their knowledge and created more organized notes at a more successful rate.

Previous studies examined the demand of organization and follow-through. These two requirements were the driving force for the current study. The five participants with special needs from junior to senior level in high school demonstrated that with organization of content and following all teacher modeled steps, increasing

effects on increasing grades were shown. Overall participation also improved as participants had more confidence because of better memorization of content. This study compared to McCleery and Tindal's (1999) study, showed that the results were similar in that the participants in both studies had exposure to rules-based templates that were designed to help organize content and therefore outperform others without the support of a graphic organizer.

Limitations

Throughout the study, all five of the participants demonstrated an overall increase in performance with the utilization of a graphic organizer. The increase of performance was dependent in whether or not the use of a graphic organizer would result in an increase in an improvement in student results. Although the participants were given teacher support and guidance in the first two weeks and not the last week, the level of independent creation was only measured for one week. The absence of this intervention in the future will need to be a reminder to students to check-in for support and advocate for themselves if needed in order to keep their consistency. With continual self-advocating, this could help increase the confidence in class discussions and study preparation with more organized content.

In the study, the last week participants were to demonstrate their independence with the collection of data using the graphic organizer. The sample size of the study was limited to five special needs students in a junior and senior level class. A larger sample size or even extended time on the study could provide more information on futuristic approaches made by the participants.

Practical Implications

In this study, the participants experienced the utilization of a graphic organizer in their science class to assist with content. The overall percentages with data collection from each week showed that the students had an increasing ability to use and apply a graphic organizer. Students advocated more for themselves by asking questions as they input the science content into the graphic organizer and slowly began to see the improvement in their collection and organization of notes. Increase participation and the completed and organized graphic organizers from the students, allowed the students to set new goals so that each week they would attempt to complete the graphic organizer with less assistance and more self-confidence.

Future Studies

Research should continue to study the utilization of graphic organizers for all students. A large group of students who wanted to take part in the creation of the graphic organizer that were not participants showcased a liking of how it neatly outlined important content for assessments. Other studies could focus on the study habits of students and if the organization of content in the form of a design template (graphic organizer) is helpful or not. Studies can also examine the student's need for study skill education and how to properly input important information that can also be retained. A control group can also be incorporated with students of non-learning disabilities and those with learning disabilities to identify with whom the intervention works best. Finally, a diverse mixture of students should be investigated.

Conclusion

The following question was examined in this study: Can the use of a graphic organizer improve student outcomes on lab and benchmark assessments? The data from the study illustrated that all five of the participants demonstrated positive effects with the use of a graphic organizer. Through increase of class participation and student feedback, students shared that they were excited about their improved results and that they experienced an overall increase in self-confidence from understanding content better in class because of the organization. In the final week, students, although reluctant to ask for assistance, stated they only asked for minimal assistance to show the teacher that they were on the right track. The use of graphic organizers proved very beneficial to the group of students with special needs so much that for two of the five it has become part of the students' IEP. Once the graphic organizer template is created and modeled, minimal time is needed to put it into place. When the students can then see the benefit to planning and preparing prior to a lesson, they are then more eager to create and apply notes from the lesson independently and successfully.

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